A McGraw-Hill Publication
San Francisco, Calif.

November 15, 1926
25 Cents

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

Complete Tank and Circulation Water Heaters

Wall-insert Heater

Round-type Heater

Light portable

Now - a five year guarantee

on the improved heating element of the

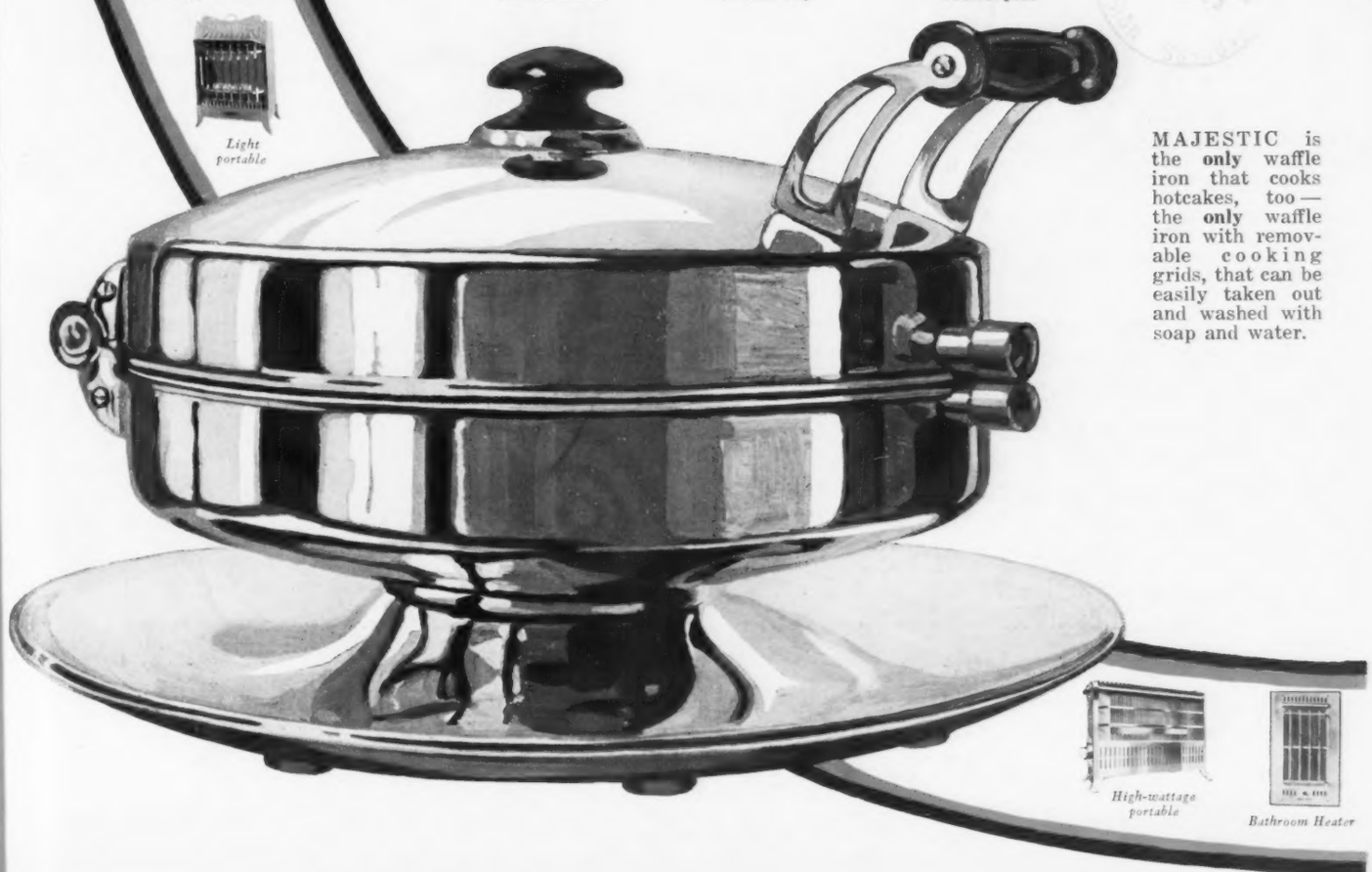
MAJESTIC

Electric Hot Cake and Waffle Iron

In quality of materials and workmanship, in sparkling beauty, in practical performance, the MAJESTIC has always been the leader in its field. Now we have added a feature that puts MAJESTIC another long step ahead of all competitors. A heating element with a **five year guarantee** means greater satisfaction for the customer—more sales and more profits for the dealer.

MAJESTIC ELECTRIC APPLIANCE CO.
Incorporated

San Francisco **Kansas City** **Philadelphia**

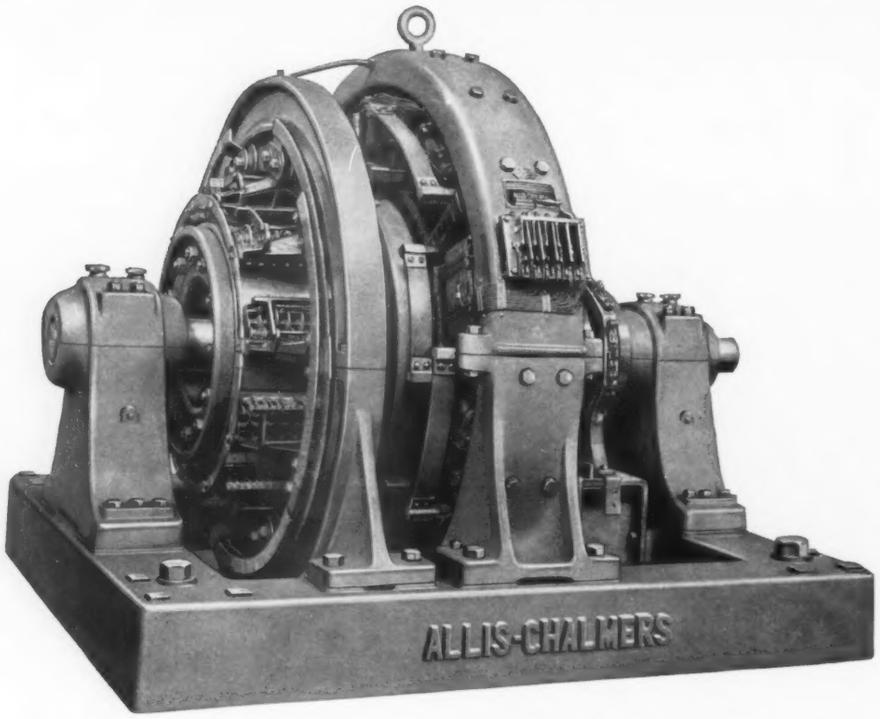


MAJESTIC is the **only** waffle iron that cooks hotcakes, too — the **only** waffle iron with removable cooking grids, that can be easily taken out and washed with soap and water.

High-wattage portable

Bathroom Heater

ALLIS-CHALMERS



1000 Kw., 600 Volt D.C., 6 Phase, 60 Cycle, 720 R.P.M. Rotary Converter

Rotary Converters

The synchronous converter affords a convenient and economical means for converting electrical energy from one form into another.

They are adapted to railway and various kinds of industrial service, mines, steel works, municipal service and many other installations.

The frog leg winding with which they are now equipped assures perfect commutation under all conditions of load.

PRODUCTS:

Electrical Machinery
Gas Engines
Steam Engines
Steam Turbines
Condensers
Oil Engines
Hydraulic Turbines
Pumping Engines
Centrifugal Pumps
Mining Machinery
Metallurgical Machinery
Crushing Machinery
Cement Machinery
Flour Mill Machinery
Saw Mill Machinery
Air Compressors
Air Brakes
Steam and Electric Hoists
Farm Tractors
Power Transmission Machinery

ALLIS-CHALMERS MANUFACTURING CO.
MILWAUKEE, WIS. U.S.A.

Journal of Electricity entered as second class matter, February 17, 1921, at the post office at San Francisco, under the Act of Congress, March 3, 1879.
Published the 1st and 15th of each month, at 883 Mission Street, San Francisco, California.

NOV 26 '26

©C1B 715452

Journal of Electricity

With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."

Devoted to the Economic Production and Commercial Application of Electricity

IN THE ELEVEN WESTERN STATES

A McGraw-Hill Publication

Published Semi-Monthly

Established 1887

C. T. HUTCHINSON, Editorial Director

G. C. TENNEY, Managing Editor

W. A. CYR, Associate Editor

G. R. HENNINGER, Associate Editor

B. H. SNOW, Northwest Editor

VOLUME 57 | SAN FRANCISCO, NOVEMBER 15, 1926 | NUMBER 10

Contents

Editorial 361

Evolution of a Transmission System 365
By A. H. MARKWART
A discussion of the development of the transmission system of the Pacific Gas and Electric Company in relation to its markets and reasons for the choice of the Sacramento and San Joaquin River crossings.

Electrical and Mechanical Design Features of High River Crossing Spans 368
By L. J. CORBETT
Discussion of design features of 220-kv. line with particular reference to means employed for crossing navigable streams by using towers as high as 459 ft.

Structural Features of a 459-ft., 220-kv. Double-Circuit Transmission Tower 372
By WALTER DRYER
Design features of high towers used to carry 220-kv. line across Sacramento and San Joaquin Rivers.

Construction Features Involved in 220-kv. Crossing Over Navigable Streams 375
By E. H. STEELE
Numerous unique methods of construction employed both in erecting towers and stringing cable over the river crossings are described in this article.

Central Station Construction, Operation and Maintenance 378
Ideas for the Contractor 379
Better Merchandising 383
News of the Industry 388
News of the Electragists 394
Meetings 395
Personals 396
Trade Notes 398

McGRAW-HILL COMPANY OF CALIFORNIA — 883 Mission St. — SAN FRANCISCO

Northwest Office: 1206 Spalding Building, Portland, Ore.

Publishers of JOURNAL OF ELECTRICITY

JAMES H. McGRAW, President | C. T. HUTCHINSON, Vice-Pres. & Gen. Mgr. | ROY N. PHELAN, Secretary & Treasurer

WASHINGTON, Colorado Building
CHICAGO, 7 South Dearborn Street
PHILADELPHIA, Parkway at 16th St.
CLEVELAND, 401 Guardian Building
ST. LOUIS, Star Building
NEW YORK, Tenth Ave. at 36th St.

Subscription rates in United States, Canada, Mexico, Porto Rico, U. S. Possessions, Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Nicaragua, Panama, Guatemala, Paraguay, Peru, Honduras, Salvador, Uruguay, and Spain, $2.00 per year, 2 years $3.00. Elsewhere $3.00 Gold (13 Shillings). Single copy, 25c. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

McGRAW-HILL PUBLISHING COMPANY, Inc.
New York
Publishers of
American Machinist—European Edition
(*Published in London*)
Industrial Engineer
Electrical Merchandising
Chemical and Metallurgical Engineering
American Machinist | Successful Methods
Electrical World | Electric Railway Journal
Engineering and Mining Journal
Bus Transportation | Engineering News-Record
Coal Age | Radio Retailing | Power

Copyright, 1926
By McGraw-Hill Company of California

Entered as second-class matter Feb. 17, 1921, at the Post Office at San Francisco, California, under Act of March 3, 1879.

Member Audit Bureau of Circulation

Printed in U. S. A.

220-kv. Transmission Takes to the Air

ANOTHER transmission record has fallen before the steady advancement of the art of high-tension transmission. The mere establishment of a new record is not as noteworthy as is the fact that the record is but a by-product of the economic considerations entering into the planning and execution of a modern power system.

In this issue may be found a series of articles covering the economics and general system problems, the electrical design features, the structural design, and the construction methods involved in the dual river crossing spans of the Pacific Gas and Electric Company's latest addition to its 220-kv. transmission system. These discussions have been prepared by the men most intimately engaged with the details of this project. They give not only information of interest to the transmission engineer, but also give an insight into some of the many problems met with in the expansion and correlation of the various units of a power system that has grown from many and widely separated small beginnings.

At first glance it may seem that an unwonted amount of space has been devoted to this one enterprise. However, second thought surely will establish the value and usefulness of such articles not only for the immediate interest, but also to provide for future reference, an historical record of Western engineering developments. In an effort to furnish its readers with such authentic reference material the Journal of Electricity's editorial staff traveled more than 7,000 miles per man during the first nine months of 1926.

For Speed and Safety!

EVERY part of Durax is built for speed and safety—from the conductors of genuine Durawire right through the rugged protecting sheaths to the black, shiny surface, every part helps you do a better job in less time.

So flexible that it takes right-angle bends without cracking, Durax nevertheless has ample strength to resist the roughest handling.

Special compounds penetrate every fibre of the cover, sealing the surface against moisture, corrosion, and other evils that are present in concealed work.

With Durax you can work direct from the coil, eliminate short ends, and save time, labor and money.

Certainly! Durax is Approved by the Underwriters' Laboratories Inc.

Specify DURAX

Reg. U. S. Pat. Off.

The Non-Metallic Sheathed Cable of Known Quality

It's one of the Durabilt Products
made by the Tubular Woven Fabric Co., Pawtucket, R. I.

Pacific Coast Representotives

ALLIED INDUSTRIES INC.

455 Second Street, San Francisco
305 Ninth Street, Oakland
1256 Factory Place, Los Angeles
53 Fourth Street, Portland
532 First Ave., South, Seattle

EDITORIAL

Futility or Fruition—Which?

YEAR after year the same old story comes to the fore—that the most fundamentally vital sections of the Pacific Coast Electrical Association are the last to effect and perfect a working organization. This condition is the fault of no one individual or any single group of individuals, but is the result of lack of system.

Economics demands that this lethargic condition be rectified by wiping the slate entirely clean and starting over again with a thoroughly reorganized personnel and vision cleared of cobwebs. A year is all too short a time for a committee or a section to accomplish the important work that will justify the continuance of its existence. To fore-shorten this meager period by regularly eating up half of it in building a working organization is costly in the extreme to the industry. A better example of a desirable situation could not be given than to refer to the organization of the Engineering Section wherein committee and section work is carried on upon a basis of complete continuity, the close of a fiscal year witnessing committees already reorganized and "ready to go."

Voters Reject Water and Power Acts in California and Oregon

LITTLE Red Riding Hood has outwitted the wolf again. Voters in both California and Oregon overwhelmingly repudiated at the November elections the radical attempt to place the operation of the light and power industry in the hands of the politicians. The famous California Water and Power Act has taken its third crushing defeat. Similarly the hopes of the few proponents of the Housewives' Bill in Oregon were exploded with a loud bang.

The campaign for and against the Water and Power Act in California was not marked by the feverish efforts extended by both parties in 1922 nor by the quiet determination which characterized the election in 1924. Nevertheless none of the voters were fooled, for at present indications it appears that the majority against the measure will exceed 350,000 even though the total vote this year was lighter than in the two previous elections. The ratio against the measure probably will exceed two and a half to one as against two and three-tenths to one in 1924. In the face of three such overpowering defeats it does not seem probable that the proponents of this act will have the courage to initiate it a fourth time.

In Oregon the expression against socialization of industry as represented by the vote against the Housewives' Bill was even more marked. Indications are that this measure went down to a four-to-one defeat, cities and rural districts alike adding to the total by which the bill was snowed under. The electrical industry of Oregon waged an unostentatious but forceful campaign of public education which seems to have borne fruit. However, there is a feeling in the state that many advocates of government ownership voted against the Housewives' Bill because it was so objectionable. If the proponents of state-owned water and power agree upon a less drastic measure it is likely that such legislation will be introduced again at a later date.

In face of returns from the two electons it appears that the public is thoroughly satisfied with the present system for the supply of electric energy. And why should this not be so? In the face of rising costs of living and startlingly increasing costs of government, the cost of electric energy is cheaper today than it ever has been in the history of the industry.

Making the Young Engineer of More Value to His Employer

IF every employer knew how each of his employees felt about the particular job to which he had been assigned there would be little reason for personnel departments and certainly less labor turnover, using labor in this sense to apply to all manpower. In the electric light and power business a high percentage of the young men who are expected ultimately to fill the gaps in the executive staffs are drawn from the ranks of young engineering graduates. It is refreshing to know what one of these young men thinks of his job, his prospects and those of any young man in a similar position in one of the central stations. In a recent issue of one of our contemporaries such a young man sets down his feelings after four years with the particular company with which he is associated. In one place he says:

> Employers are principally interested in students who rank among the first 40 per cent of the class, based on grades and general standing in college. The lower 60 per cent gradually drift into other fields or fill routine, mediocre positions in engineering or allied work. As an exception to this general statement it is worth while to mention the extremely bookish impractical type who makes high grades but who must be eliminated from this consideration.
>
> Of the 40 per cent, the industry is very much concerned with the more capable ones who have such active minds and good personality that they can readily adapt themselves to work in allied fields, not specifically engineering, which pay more. Financial investigation and engineering salesmanship are occupations that have drawn heavily on this group. The large company employs picked students whom they consider the very best available and then often make the training course so long and the promotion so slow that a large number of the most capable and more energetic boys go into other fields and are thus lost to the industry to which they could be of most value.

It is certain that this industry is not so well supplied with promising young men that it can afford to let such a condition pass unnoticed. Frequently executives have been heard to complain that they had a good job open but that they could not find a man in their organization capable of filling it. In some cases one needs but examine closely the men already in semi-executive positions to see that weakness has resulted from letting good men be drawn into more promising fields.

Conceivably the solution lies in dropping the popular opinion that a young college graduate must pass through an unproductive and unremunerative period of from five to ten years before he can be given a position of responsibility. Instead the young man should be given responsible work where he may not only earn a higher salary but may get the experience which will make him better fitted for the next step in the ladder of promotion.

Merchandise for Your Share of the Christmas Dollar

CHRISTMAS, so the saying goes, comes but once a year. This has become a recognized business principle for some time. If sales during the year have not been what they might have been—there's always Christmas coming. Even as to the child Christmas means an extraordinarily happy time, to the merchandiser Christmas means more sales volume and prosperity.

This expectation on the part of the merchandiser is based on good grounds. The holiday season is set apart in the average family life as a season of festivity and gifts. The family budget is squeezed for ten months of the year so that a surplus may be available for spending then. Even the banks have caught the idea implied and provided easy means of saving Christmas gift funds.

Competition for this Christmas stocking, the stocking this time into which the pennies of the year have been deposited, is keen, however. No sane merchandiser is content to trust to luck that he will share in the Christmas buying the public will indulge in these days. There are too many other merchandisers willing to show the Christmas buyer why he should spend his entire allowance on some particular article of trade. It is true that a certain prosperity may be expected as a result of natural conditions, but the electrical merchandiser who is wise will not sit and wait for these conditions to lay prosperity in his lap.

For several years the slogan, "Make this an Electrical Christmas," has been sung. Each year it brings more and more results. To those who preach that gospel this year, not necessarily in exactly the same words, but at least in effect, will come rewards based upon the accumulated advertising built up through these previous Christmas campaigns.

It is no time to slacken the merchandising effort. If a concerted Christmas campaign was successful last year, a better one this year surely will result in still greater sales. If a first rate merchandising plan in selling electrical appliances was helpful last year, such a plan this year should bring even greater rewards. If windows decorated for Christmas drew shoppers inside last year, better windows this season will attract more than ever. The Journal in its Better Merchandising section in this issue offers constructive suggestions along these lines. But from whatever source the merchandiser gets his inspiration, this Christmas season's activity should be redoubled. In like proportion will his sales increase and his own Christmas stocking be filled.

Professor Ripley Turns the Spotlight on the Utilities

ARMED with a bright spotlight and a sharp and sometimes censorious pen, Prof. William Z. Ripley has brought forth his highly anticipated article on public utilities. If any of the operating companies feared indictment, then whatever shivering in their boots they may have done has not been justified for Professor Ripley in his article, "More Light! And Power, Too," confines his attention exclusively to the holding companies. Virtues and vices, advantages and defects and a certain amount of dirty linen are given a thorough airing. It is impossible in this short space to do more than comment on some of Professor Ripley's conclusions and at the same time heartily to recommend to our readers a careful study of the article.

In the first place, the present situation with respect to holding companies can be blamed in no small measure upon the diversity and inadequacy of state laws pertaining to corporations. On this subject Professor Ripley says, "Utility managements are no less to blame for this over-extended situation than are the people of the United States. Corporations are oftentimes compelled by the diversity of state laws to resort to these artificial arrangements—albeit perhaps not without a modicum of quiet satisfaction that our conflicts of laws are so baldly permissive of profitable indirection." Certainly the electric light and power industry will heartily endorse Professor Ripley's suggestion that these state laws be both modified and standardized.

His suggestions with reference to the weaknesses in regulation brought to light by the growth of holding companies are open to considerable discussion. He says, "The impotence of state administrative agencies in the face of the growth of these great combinations is indubitable. . . . Matters of finance and accounting seem likely to play a larger part than those of rates in controversies of this sort. Over these the Federal Power Commission at the present time may take jurisdiction in those cases only where no competent state regulation obtains. But, even then, authority is limited specifically to electrical service generated by water power. It would be a relatively simple matter to enlarge the scope of this administrative body, by conferring plenary jurisdiction over all interstate matters, whether or not there were an existing state agency, and by authorizing it to deal with electric service however generated, by steam as well as by water power."

Professor Ripley's recommendation for federal regulation will not meet with favor from the utili-

ties. Undoubtedly he has not read Secretary Hoover's discussion of this subject presented at the 1925 N.E.L.A. convention. Secretary Hoover at that time said: "It has been proposed that as power districts may be no respectors of state lines, we must have federal regulation of power. I do not agree with the conclusion that federal regulation is necessary. I can see no reason for the imposition of a superior regulation, merely because Congress may have the power to exercise its authority under the commerce clause."

As in previous articles dealing with corporations, Professor Ripley urges fuller and more complete publicity, particularly in annual statements. In making this recommendation he is talking to a group which many years ago recognized the value of publicity. It is safe to say that there is no industry concerning which the public knows so much, due in no small measure to the efforts of the light and power companies themselves to shine the light of public knowledge upon even their innermost workings.

It is Professor Ripley's final conclusion with which we must disagree. He asserts that much information is needed before reform can come about. But the method he suggests for securing this information! He says: "The surest source of disinterested illumination would be a comprehensive examination into the whole subject of public utilities preferably under the authority of the Federal Power Commission or some other special board temporarily created for the purpose. Consequently a wise policy to follow at this juncture would seem to be to refrain—ostentatiously, as it were—from advocacy of any particular program; but to urge instead that the President recommend to the Congress that provision be made for such an exhaustive inquiry, to be so prosecuted as to command the confidence of the entire country. . . .

"A searching inquiry by real experts, stripped of all political bias and affording a field day for all comers; an open contest in which the truth, regardless of self-interest, shall prevail—this is the downright need of the moment. . . ."

How fine! How splendid! A congressional investigation "stripped of all political bias!" "A field day for all comers," including the radical press and the socialistic advocates of government ownership. Rather, if it followed the usual course of such investigations, it would develop into a political muckraking contest in which the good would be smeared with the mud from the bad. Neither Professor Ripley nor anyone else in this country can promise a congressional investigation "stripped of all political bias."

Secretary Hoover, to quote him a second time, has said of the electric light and power industry: "We are in the midst of a great transformation in the development of electric power—it amounts almost to an industrial revolution, for it bears upon its wings the most profound advance of American industry in a generation." It is conceivable that in the course of this transformation and reconstruction some of the evils which Professor Ripley credits to the industry have developed. But he himself admits that many of the companies are taking steps to correct the situations which have grown out of expansions and consolidations. Is it not equally possible that ultimately all may be corrected without legislation and without investigations? The experience of the electric light and power industry to date has been that if left alone, unhampered by political meddling, it will rectify its own mistakes. Its record in its comparatively short life shows that, since its inception, rates have gone down, service has become better, and that public confidence in its operations has increased.

Wherein Statistics Leave the Best Part of the Story Untold

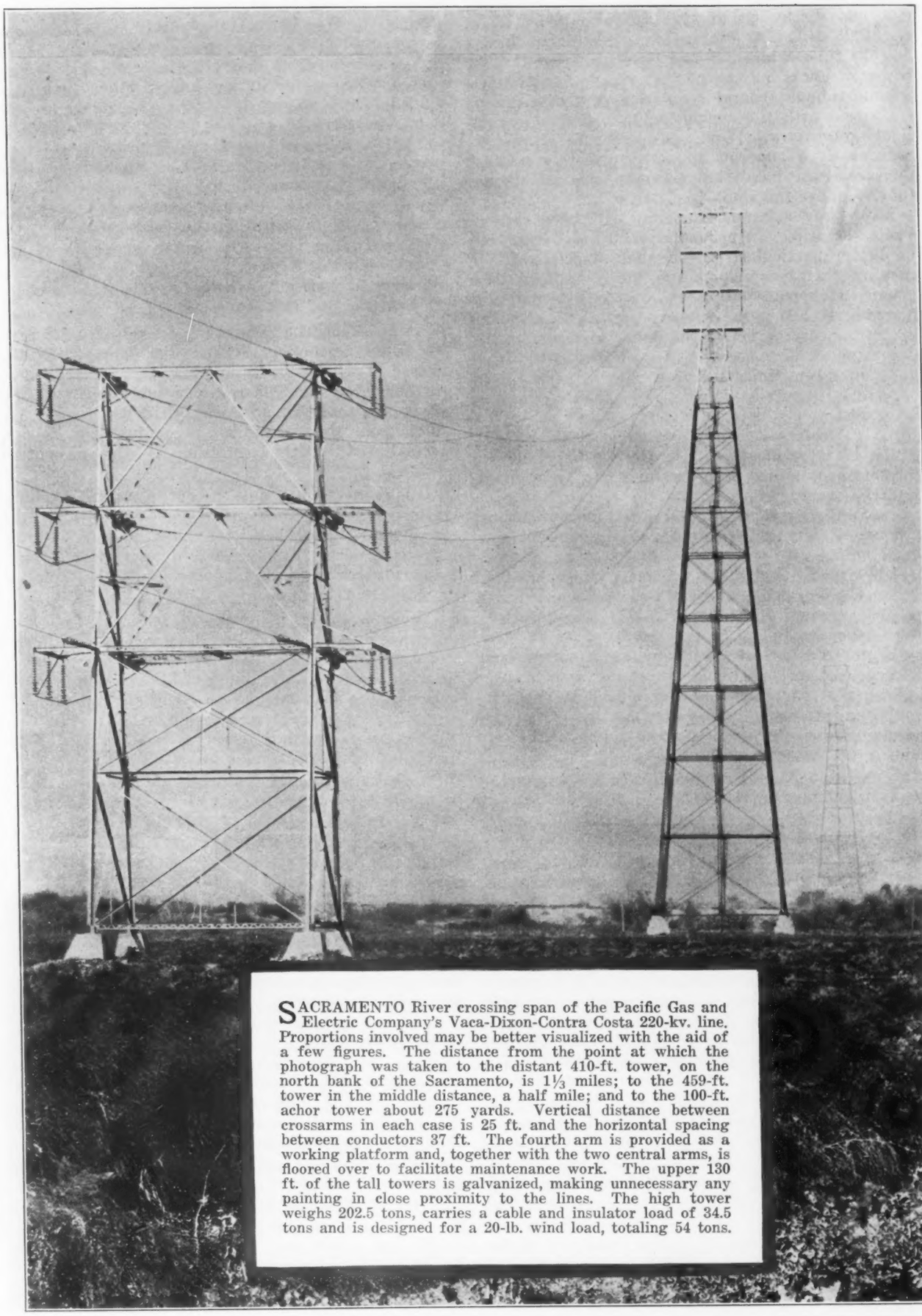
OFTENTIMES discouraging are the actual figures as to the number of Red Seal homes recorded, viewed in proportion to the effort being expended to further this plan. The organizations supporting the effort are tempted, no doubt, to demand more results from the expenditures in time and money necessitated by the operation of the promotion set-up.

It is rather a pity that the entire results accruing from this sales effort on the part of the Red Seal organization cannot be tabulated in full. These effects resulting from the Red Seal cause would show a much more promising outlook for the final outcome of the campaign.

There are, for instance, in one tract of new homes, fourteen Red Seal homes actually under construction. These figures are all that actually may be seen by those supporting the plan. However, to the field man these represent but the beginning of a project which will result in 110 Red Seal homes—a rather more favorable story. This is typical of many similar cases.

Moreover, although numerous homes have been built reflecting Red Seal standards, many of them, because of the omission of perhaps a single outlet in the dining room, where two are called for, have not been awarded a Rel Seal certifiicate and therefore cannot be counted in the summary of work accomplished. To all intents and purposes these homes, adequately wired in practically every other respect, are Red Seal homes in effect if not in fact. At least the purpose motivating the Red Seal plan, that of providing possibilities for greater domestic load, is being satisfied in such homes.

It is too early to pass judgment on the afficacy of the Red Seal plan. It is yet in the stage of development in which it must overcome initial inertia. When the body of home-building once starts moving toward the Red Seal idea—and it is beginning to budge in that direction at present—the gathering impetus of that movement will bring forth the rewards which sometimes seem so remote today. The convenience outlet campaign which preceded the Red Seal plan today is bringing home the results hoped for originally and doing so now under its own momentum. Will not the Red Seal plan prove to be similarly successful in the long run, if our patience remains with us?



SACRAMENTO River crossing span of the Pacific Gas and Electric Company's Vaca-Dixon-Contra Costa 220-kv. line. Proportions involved may be better visualized with the aid of a few figures. The distance from the point at which the photograph was taken to the distant 410-ft. tower, on the north bank of the Sacramento, is 1⅓ miles; to the 459-ft. tower in the middle distance, a half mile; and to the 100-ft. achor tower about 275 yards. Vertical distance between crossarms in each case is 25 ft. and the horizontal spacing between conductors 37 ft. The fourth arm is provided as a working platform and, together with the two central arms, is floored over to facilitate maintenance work. The upper 130 ft. of the tall towers is galvanized, making unnecessary any painting in close proximity to the lines. The high tower weighs 202.5 tons, carries a cable and insulator load of 34.5 tons and is designed for a 20-lb. wind load, totaling 54 tons.

Evolution of a Transmission System

Growth Necessitates Consideration of Many Different Factors

By A. H. Markwart

Vice-President in Charge of Engineering, Pacific Gas and Electric Company, San Francisco

TRANSMISSION towers from 269 ft. to 459 ft. in height have been erected by the Pacific Gas and Electric Company to carry two 220-kv. lines across the San Joaquin and the Sacramento Rivers near Antioch, Calif. In this paper Mr. Markwart discusses the economic and other considerations that led to the selection of this particular means of providing for an increasing delivery of Pit River Power to the Bay region load centers. Interesting features of design and construction are described in other articles appearing in this issue.

THE desideratum of transmission throughout California has always been that of routing power in a southerly direction to the markets. This characteristic tendency may be noticed with a glance at a transmission map of the state. The Pacific Gas and Electric Company, in common with others, has had a similar problem, and with the bringing in of the Pit River power the difficulties of a long transmission in the southerly direction were emphasized.

Moreover, that company and its predecessors, to get power to the southern end of its system, were confronted with the necessity of crossing the navigable waterway which separates its distribution territory from Sacramento to the ocean. This feature presented itself with the company's first long distance transmission. There were only three general locations where crossings could be effected, the Golden Gate Strait, the Carquinez Straits and the lower Sacramento-San Joaquin River region above Antioch. In the early days when Martin and De Sabla decided to bring hydroelectric power from the Colgate plant to Oakland, they deemed such a crossing one of the greatest difficulties to be overcome. In 1901 the Bay Counties Power Company, a predecessor, effected an overhead crossing at Carquinez Strait. This was considered a worthy feat and solved one of the major problems which arose in the building of the transmission lines from Colgate to Oakland, a distance of 140 miles.

Of the several crossings among which selection was to be made, that at Carqinez was the shortest and the most direct route to the chosen terminal. The span there is 4,427 ft. between the main towers, the total length from anchorage to anchorage being 6,277 ft. There are three steel towers: North Tower, 225 ft. high, and the Leaning Tower, 84 ft. high, both on the north side of the straits, and South Tower, 60 ft. high on the south side. The transmission voltage then was 60 kv. Originally one circuit and a spare cable, four cables in all, were provided. In 1914 two more cables were added thus providing two circuits.

Perhaps the most important factor in the development of large blocks of power in places remotely situated from the market is the voltage at which the power should be transmitted. When the Pit River development was under investigation the engineers of the company determined the tranmission voltage on a purely economic basis, due regard being paid to all of the elements entering into the problem. A voltage of 220 kv. offered the most economic answer.

In the development of a river which would yield as much power as the Pit it became necessary also to give consideration to the size of the power blocks which from time to time should be brought in to meet the anticipated load requirements. The annual peak-load growth for the system in recent years has been or the order of 25,000 to 30,000 kw., of which it is considered economic to supply roughly three-quarters from new hydro developments. As it takes at least two years to build a Pit River plant one of 50,000 to 60,000 kw. is of suitable capacity at the present time. With the compounding of the growth which is taking place, even larger plants in the future may be completed every two years. The installed capacities on the Pit River are, or will be, approximately as follows:

Hat Creek Nos. 1 and 2 (combined)		25,000 kv.
Pit River No. 1		70,000 kv.
Pit River No. 2		15,000 kv.
Pit River No. 3		81,000 kv.
Pit River No. 4	Future	100,000 kv.
Pit River No. 5	Future	140,000 kv.
Pit River No. 6	Future	51,000 kv.
Utilmate total		482,000 kv.

From the above the peak output will be of the order of 378,000 kw. With this step development of generating facilities a plan for transmission was required which would be susceptible of correspondingly progressive development on an economic basis. Such a plan also had to be comprehensive so that when fully realized it would provide a transmission avenue for all of the power which was expected to be available from the Pit River.

Upon the completion of the Pit River No. 1 and the Hat Creek No. 1 and No. 2 plants, with a combined peak output of 75,000 kw., it was considered necessary to deliver the power from these plants

at a convenient point north of the Sacramento River. This was done in order that it could be routed, initially, over existing lines by way of the Carquinez Straits to Oakland leaving a way open for the routing of the future power further south to a point near the lower end of San Francisco Bay. Various considerations fixed this first terminal on

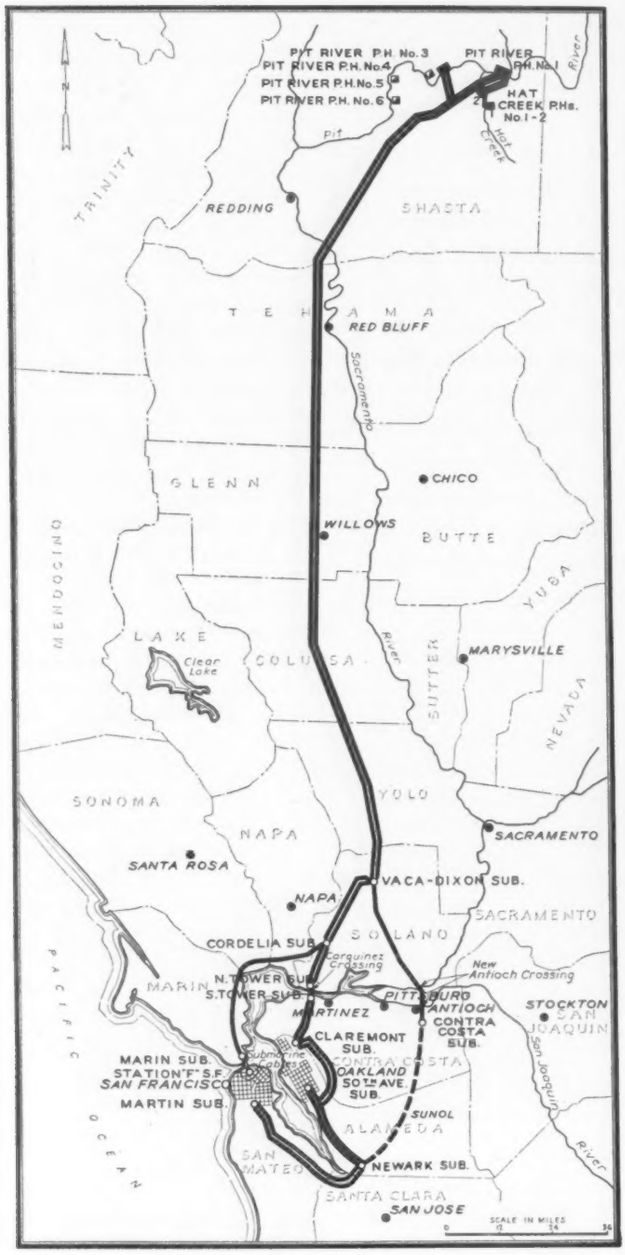


Fig. 1. General map showing relation of Pit River transmission system to San Francisco Bay load centers.

the state highway between the towns of Vacaville and Dixon, and the Vaca-Dixon substation was established to accomplish the purposes mentioned.

Reinsulation of Carquinez Crossing

Somewhat concurrently with other major construction the original 60-kv. bay lines crossing the Carquinez Straits were replaced by a double-circuit 110-kv. line which was tied in at Vaca-Dixon thus providing for delivery of a substantial block of Pit power to Oakland. The crossing at Carquinez was re-insulated for 110-kv. operation and became an important element in the transmission line between the Vaca-Dixon substation and Oakland. (See Fig. 1.) Subsequently the Claremont and 50th Avenue substations in Oakland were connected to Newark by a double circuit 110-kv. line and the older Drum-Cordelia 110-kv. line was looped through Vaca-Dixon substation thereby permitting the Cordelia substation to become an outlet for Vaca-Dixon substation. This permitted the routing of a small block of Pit power to San Francisco by way of the Cordelia-Marin 60-kv. tower line, the Marin substation, and the bay cables across the Gaten Gate.

However, with the advent of higher voltages new elements came in for consideration in the selection of a crossing of this water barrier. While the Carquinez region permitted the operation of a voltage of 110 kv. it was deemed unsuited to operation at any considerably higher voltage because of the unfavorable climatic conditions and the prevalence of industrial fumes and gases. The Golden Gate Strait, on the other hand, was eliminated as a crossing by the difficulty attendant upon obtaining permission from Government authorities for an overhead span, together with the presence of fogs detrimental to high-voltage operation. The great number of cables which would have been necessary at the highest cable voltages then considered acceptable likewise precluded a submarine crossing at that point.

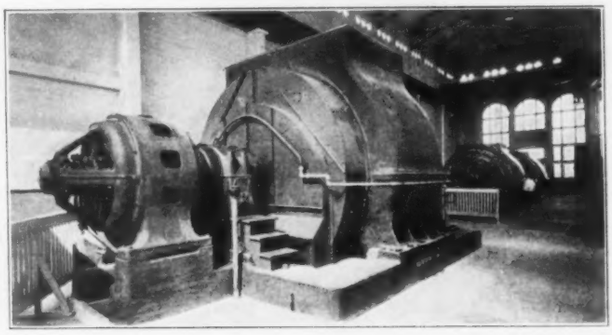


Fig. 2. 80,000-kva. synchronous condenser capacity at Vaca-Dixon substation. The new 40,000-kva. unit is in the background.

The region in the vicinity of Antioch, however, was considered suitable for a crossing and moreover a location thereabouts permitted the whole line to be routed in a southerly direction to the east of Mt. Diablo through a territory where climatic conditions generally are regarded as favorable for operation at voltages considerably higher than those previously employed. Incidentally this route provided trunk transmission widely separated from the lines routed by way of Carquinez.

Th broad plan which was adopted contemplates in a general way the routing of the 220-kv. Pit transmission beyond Vaca-Dixon in a southerly direction to a terminus near Sunol with a 110-kv. tie to the existing Newark substation or to a terminus at the Newark substation itself, as may be decided after further study of the problem. Neither the exact location of the terminus nor details of the

line have been determined thus far because it was considered desirable to do this later and in the light of knowledge and experience obtaining after a few years of operation of the line between the Pit River and the Vaca-Dixon substation at 220 kv. However, with the exception of the exact location of the southern terminus of the Pit transmission system the general plan was sufficiently well established to permit orderly progress toward the desired end.

110-kv. Belt Line

The proposed southern terminus is in keeping with the plan for supplying the 110-kv. belt line beginning at Claremont and extending around the lower end of the Bay, ending at the new Martin substation near San Francisco. Were this belt line to be fed at the Claremont end only, one double-circuit line would not be sufficient to carry the load. Martin substation is 100 miles distant, by the route named from Vaca-Dixon substation. By also feeding into the belt line at a point near Newark there could be a ready flow of power into San Francisco. Further, the expected growth of industrial load in the Oakland, Alameda and Hayward territory would be served more adequately from the two directions than from one only.

Following the completion of the transmission scheme as far as Vaca-Dixon substation, the next step in the construction was the projection of the line farther south to furnish another outlet from

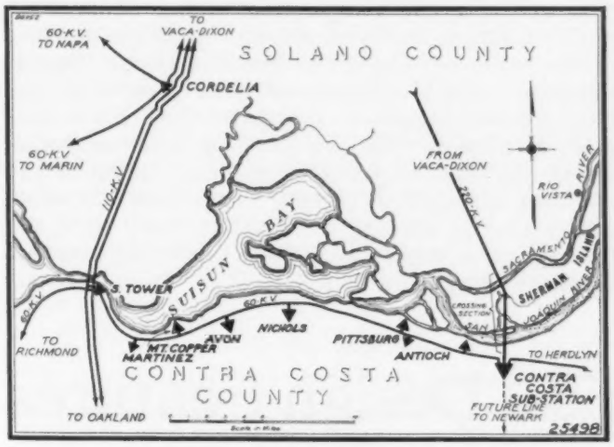


Fig. 3. Map of vicinity of crossing showing relation of local load centers.

Vaca-Dixon for the power which would be incoming upon the completion of Pit River No. 3, an 81,000-kva. development. In properly disposing of this influx of power, consideration was given to a number of related elements. Important among these was the most noticeable growth of load along the industrial littoral on the south side of the confluence of the Sacramento and San Joaquin Rivers and San Francisco Bay between Martinez and Antioch. This area for some time has been served from a 60-kv. line running from South Tower on the Vaca-Dixon-Oakland lines, to Herdlyn on the Electra-Newark line and fed generally from the South Tower end. The introduction of Pit power into this line at approximately its middle point, with the present installed transformer capacity at Contra Costa substation, would practically treble its capacity and make substantial improvement in operating conditions. Furthermore it was incumbent that any plan to be adopted for the handling of this power should co-ordinate with the general plan tentatively adopted for the ultimate disposal of the entire output from Pit River.

All things considered, it appeared most logical to carry the 220-kv. double-circuit tower line south from Vaca-Dixon across the Sacramento and San

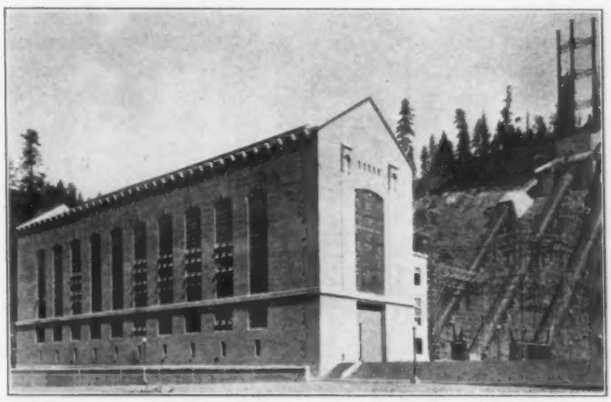


Fig. 4. Pit No. 3, fourth of the Pit string of plants; 81,000-kva.

Joaquin Rivers to a provisional 220-kv. terminus and permanent unloading substation. This led to the establishment of the Contra Costa substation near Antioch. (See Fig. 1.)

This plan had the further advantage of acquiring at once the rights-of-way for the future 220-kv. lines from Vaca-Dixon substation as far south as Antioch, leaving for future determination the exact route and terminus of the lines beyond that point. In addition it created a situation which made it possible to construct 110-kv. lines along the Bay shore to supply such industrial load centers as Antioch, Pittsburgh, Bay Point and Martinez at an earlier date than otherwise would have been possible, should the growth at these points prove to be more rapid than expected. Such a 110-kv. line would prove a highly desirable route for the delivery of power into the Claremont and 50th Avenue high tension substations were it subsequently decided to send some of the power from Vaca-Dixon to these points by other than the present Carquinez route.

With the future development of still other power from the Pit the Vaca-Dixon-Antioch line will be continued further south to a selected permanent terminus as mentioned in the foregoing. Thus, upon completion, the 220-kv. transmission system will permit the routing of power through Vaca-Dixon substation for an appropriate distribution to Oakland and waypoints including Cordelia, and to Newark or thereabouts for San Francisco and the peninsula and for the region in the vicinity of San Jose and southerly therefrom,

For the present and for some time to come the Vaca-Dixon-Antioch line will be operated at 110 kv. It is probable that even upon completion of

the line from Antioch south 110-kv. operation will continue until such a time as additional power from the Pit River is required for Newark and beyond. When such time arrives the voltage will be increased to 220 kv. approximately quadrupling the capacity of the line.

Future Transmission System

Upon the completion of the Pit River development the transmission system, relating specifically to Pit power, will be so composed of 220-kv. and 110-kv. circuits as to handle the energy adequately.

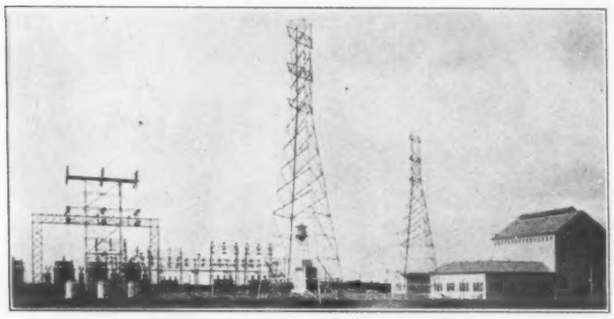


Fig. 5. Recently completed Contra Costa substation, one of the steps in the scheme of an enlarged transmission system.

This system will distribute power from the Pit River through the Vaca-Dixon substation to Cordelia for distribution to the North Bay region and San Francisco, to Claremont substation for distribution in the East Bay region, or to Newark substation en route to the South Bay area and to San Francisco. Thus in effect there is created by this general plan a 110-kv. ring bus supplying Oakland, San Francisco and the Bay region generally. This bus will be fed at both Vaca-Dixon and Newark with hydro power from Pit River and other sources.

At the present time the transformer capacity at Oakland in two substations, Claremont and 50th Avenue, is 60,000 kva.; for San Francisco, at Martin substation and at Marin substation on the north shore, 90,000 kva.; at Cordelia 36,000 kva.; at Newark substation 72,000 kva.; and at the Vaca-Dixon and Contra Costa substations, 180,000 kva. This amounts to a grand total of 38,000 kva. These capacities will be increased proportionately as the Pit River power sources are completely developed.

The transformer installation for the Pit River plants at that time will be of 450,000 to 500,000 kva. capacity, with a generating capacity of approximately the same. With increased delivery of power, as further developments on the Pit are completed, appropriate additions will be made in the synchronous condenser capacity at various points along the line.

Transmission voltage at the generating end is 220 kv. and at the receiving end, Vaca-Dixon substation, 200 kv. Synchronous condenser capacity at the receiving end in the amount of 40,000 kva. per circuit holds the terminal voltage fairly constant. The line capacity under this condition, with 500,000-circ.-mil copper conductors, is approximately 250,000 kw. for the two circuits now in place over the 200 miles between the Pit River No. 1 plant and the Vaca-Dixon substation. Conductors on the present single circuit from Vaca-Dixon to Contra Costa substation also are 500,000-circ.-mil copper, in line with the comprehensive plan. Present condenser capacity at Contra Costa substation is 15,000 kva. which accomplishes the necessary power-factor correction for the industrial load in that vicinity.

The Vaca-Dixon-Newark 220-kv. line upon completion will be in effect an interconnection of large capacity between the northern and southern portions of the power system of the Pacific Gas and Electric Company, taking into account both owned and purchased power supplies. In other words this is just another step in the evolution of interconnection which has been observed in the building up of the so-called superpower system. This interconnection of parts of an existing system has come, as it has in the past, in other cases, when there was economic necessity for such a step.

Electrical and Mechanical Design Features of High River-Crossing Spans

By L. J. Corbett

Assistant engineer, Hydroelectric and Transmission Division, Pacific Gas and Electric Company, San Francisco

THE cable selected for the river crossings encountered on the Vaca-Dixon-Contra Costa 220-kv. lines was chosen after considerable study. If 500,000-circ.-mil copper were adopted as for the remainder of the line the working strength permissible under company practice would have been 8,630 lb., and the sag for the longest span would have been of the order of 365 ft. This with the channel clearance required would have called for towers about 650 ft. in height, or 100 ft. higher than the Washington Monument.

It was believed that the conductor used at the crossing should have conductivity of such a value that the current-carrying capacity of the line as a whole would not be reduced. For this reason the limitation of a 400,000-circ--mil copper equivalent was set to guide the investigation.

A study then was made of hypothetical conductors. Their characteristics were tabulated. The table covered such items as diameter, ultimate strength, weight per foot, copper equivalent, sag for certain selected spans, and a relative factor—the ratio of strength to weight. Various combinations were tried, from all-steel, all-copper, all-bronze, or

all-Copperweld to different combinations or bronze and copper and of Copperweld and copper. Comparative tower-cost estimates made by the civil engineering division indicated that a material saving could be effected by using one of the combination conductors rather than pure cupper. Accordingly a tentative combination was selected and formed the basis of negotiations with cable manufacturers.

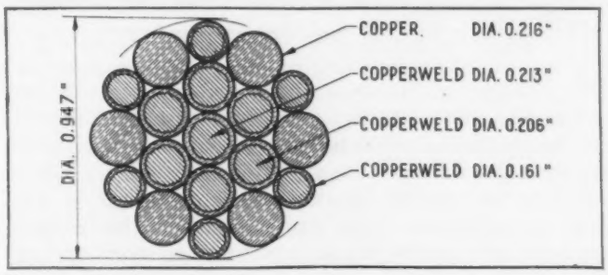


Fig. 1. Section of cable used for crossing spans showing arrangement of copper and Copperweld strands.

Incorporating certain suggestions of the Copperweld Steel Company and the John A. Roebling's Sons Company, the final cable selected was the mixed strand shown in Fig. 1. The Copperweld wires were of the "Xtra-Hi-Tensile" quality with conductivity 30 per cent of that of pure copper. Four sizes of wire were employed. The center wire is 0.213-in. Copper weld; the intermediate layer consists of 6 Copperweld wires 0.206 in. in diameter; the outer layer consists of 6 hard-drawn copper wires 0.216 in. in diameter alternated with 6 Copperweld wires 0.161 in. in diameter. The cable is concentric lay with both layers in the same direction to make a very compact strand. Overall diameter of this cable is 0.947 in.; its weight 2.16 lb. per ft. and its conductivity equivalent to 416,600-circ-mil copper. The working load of about 20,500 lb. maximum allows a factor of safety of 2.5 over the ultimate strength estimated by the manufacturer and a safety factor of 3 over the ultimate strength of 63,950 lb. found by test of a short piece of the finished cable.

Iusulator System

In recent years suspension type insulators have been developed to a stage meriting considerable confidence, and multiple strings have been used on important spans successfully. For a long time the Pacific Gas and Electric Company adhered to the conservative policy of using insulators only in compression on spans of especial importance. This policy was followed in the reinsulation of the Carqinez span in 1922 when the voltage was changed from 60 kv. to 110 kv.

In the present crossing, however, dependence has been placed upon suspension type insulators in multiple strings. A factor of safety of approximately 4 is provided which is reduced to 2 in case of mechanical failure of any insulator unit, when the load is taken up by the other parallel string or strings.

The general scheme of the crossings is shown in the profiles in Fig. 3. The tension in the conductors is held by low, but strong, anchor towers situated well back from the river banks. Only the weight and any pressure due to wind is carried on the high towers at the long spans. The tension in each cable at the anchor towers is held by a special quadruple dead-end string, and the weight at the span towers is held by a double suspension string. "Extra strong" suspension insulator units are used in both assemblies.

The double string used at the span towers shown in Fig. 2 presents no unusual features. A plate-steel link and yoke support the two insulator strings from the tower and the cable rests in a groove on a long thin cast steel saddle. The strings are mounted in the plane of the line. A shackle above and bolt holes in the center line of the saddle provide attachment for take-up equipment when insulators are to be changed. The separate strings are similar to those used by the company on its other 220-kv. lines except that they are longer by four units. The same type of corona shield is used next the conductor as is used on the line suspension strings.

Limitations are set in the yoke so that in case of a broken insulator in one string the permanent parts will not be damaged. The long elastic cable, it is believed, will take up adequately the shock which

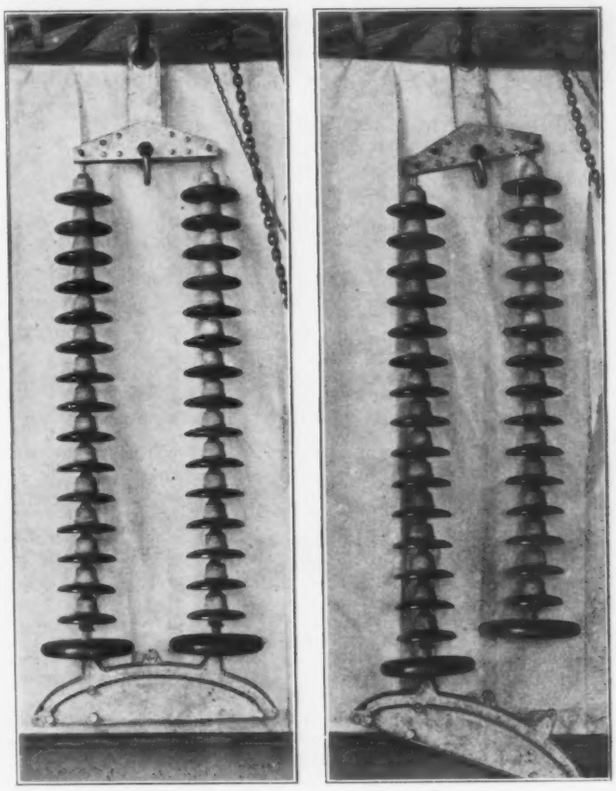


Fig. 2. Arrangement of suspension strings. The effect of one broken string is shown at the right. The cable support is so designed that the distance from upper support to cable is varied slightly by failure of one string.

ordinarily might be expected upon a sudden shift of load to the remaining string or strings. The position the string will assume in case of a broken string also is shown in Fig. 2.

The quadruple string is of unique construction in that the four strings are not in the same plane, but are set at the four corners of a square section

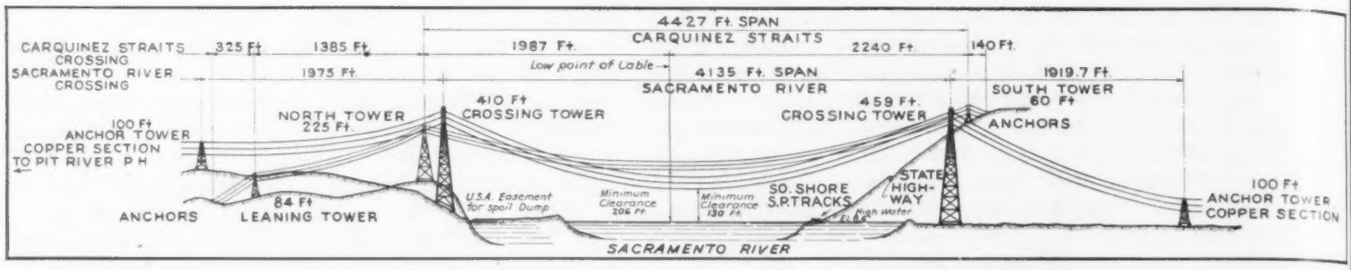


Fig. 3. Side elevation of Sacramento River crossing with elevation of old Carquinez crossing superimposed for comparison (left). Simi

and equalized in pairs across the diagonals of the square. The way this is accomplished may be understood from Fig. 4. Only four insulators were used in each string for the photograph assembly for convenience and to permit the closer view.

The lower frame holding the sheave to which the line conductor is attached is rigid, the equalization being accomplished by means of the yoke system on the tower end. The main yoke next to the tower is solid. One of the cross yokes holding two insulator strings is in two parts, pivoted in the center; the other is solid. The latter two yokes are at right angles to each other and are held in this relation by bolts through a forged steel link. The two half-yokes are suspended to the upper yoke midway between the center pivot and the points of attachment of the insulator strings. The upper set of holes in the forged link are slotted while the bolt which goes through the holes is fixed in the main yoke.

When the tension in the separate strings is uniform, a condition which can be attained by adjustment of jack screw stems and nuts on each string, the bolt in the main yoke is at the center of the slotted hole as shown in Fig. 4 (left) and carries no load. If one of the strings on the divided yoke is broken the tension on the opposite string also is relieved; the strings on the solid yoke take the load and transmit it through the forged link to the center of the main yoke, the upper surface of the slotted hole now bearing on the pin. This is shown in Fig. 4 (center).

If one of the strings on the solid yoke is broken,

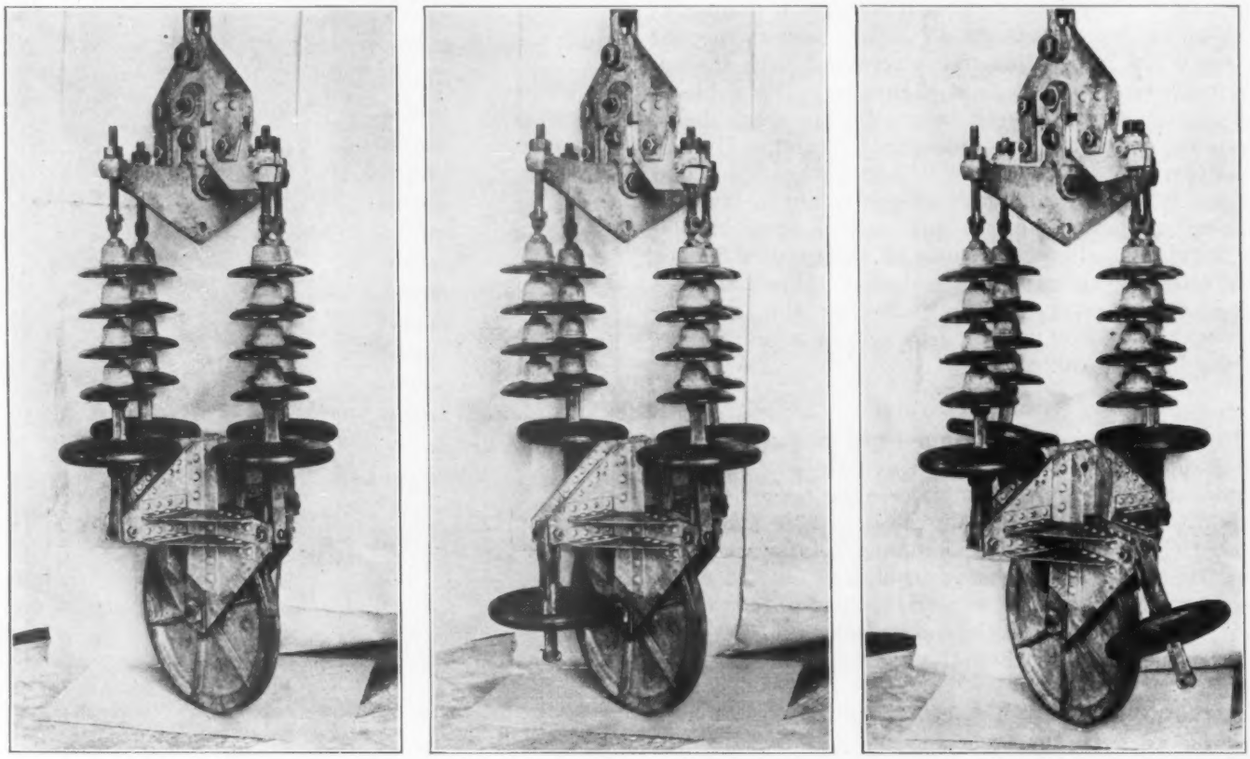


Fig. 4. Quadruple strain strings, shown in fore-shortened assembly for photographic facility. Intact assembly at left; one string on divided yoke broken, center; and one string on solid yoke broken, right. In the event of failure of any string the tension also is relieved from the opposite string through the yoke action.

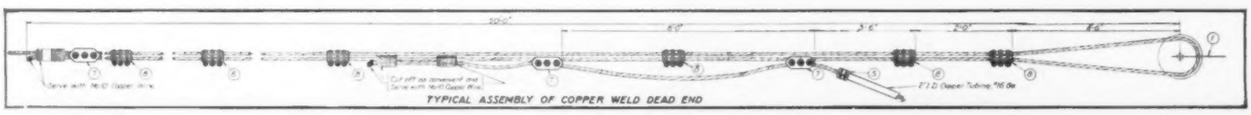
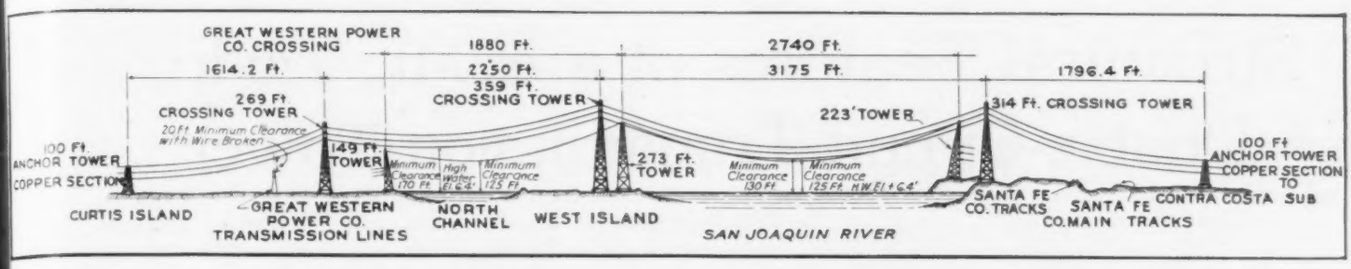


Fig. 5. Typical assembly of Copperweld dead-end showing method of serving and attaching copper cable thereto.

PRINT IN BINDING



ar elevation of San Joaquin crossing with adjacent crossing of Great Western Power Company 66-kv. line superimposed (right).

the tension on the opposite string is relieved; the strings on the divided yoke take the load and transmit it through the attaching links at the half-way points to the ends of the main yoke, the lower surface of the slotted hole in this case bearing on the center pin. This is shown in Fig. 4 (right). For this contingency it was necessary to provide swivels for he insulator supports on the divided yoke.

The amount of "drop" or "give" in the assembly when an insulator breaks can be planned as small as desired by properly dimensioning the slotted hole in the forged link. The present assembly permits $\frac{5}{8}$ in. in either direction.

As in the double string, holes are provided on the sheave frame and on the lower yoke for the attachment of any supplementary equipment desired

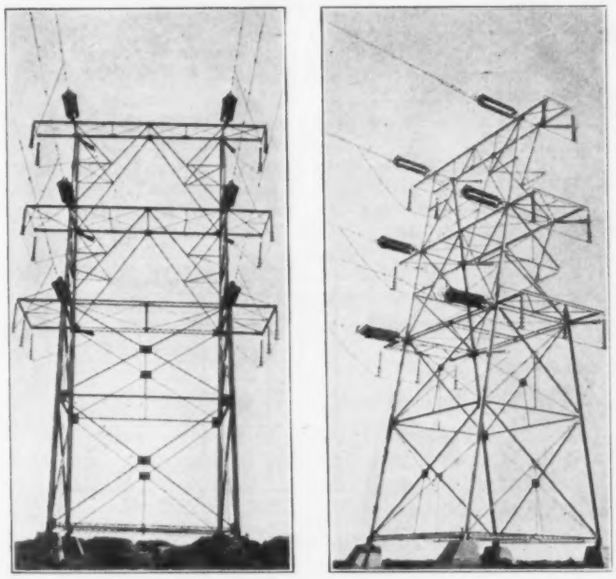


Fig. 6. Completed anchor tower showing appearance of dead-end assemblies, etc. Note rigid copper tubing carried past tower on three insulator strings. Flexible copper cable is strung through this tubing for rigidity.

for erection purposes or for major changes of insulators. Occasional changes of individual insulator units can be handled by relieving one set of strings at a time by means of the jacks provided at the tower ends of the strings, the other pair taking the entire load.

Attachment of Cables to Anchor Strings

The Copperweld cable is turned back over the sheave on the quadruple dead-end string, is carried back 50 ft. and attached to the strain cable by six clamps of special design which are held by three U-bolts each, as shown in Fig. 5. The 500,000-circ.-mil copper cable of the standard section of the line is carried through the standard strain clamp on its side of the tower and is used as a loop. The first attachment of the loop to the Copperweld cable is beyond the second clamp holding the main cable and free end after its turn about the sheave. The loop is connected to the short end of the Copperweld cable by parallel-groove bronze clamps and serving.

The 50 ft. of Copper weld cable turned back from the sheave serves a two-fold purpose. First it allows ample length for the adaptation of any attachments in case removal or readjustment of a cable may become necessary. Second with the further addition of the end of the loop, it serves the immediate and continuing purpose of cushioning out vibrations in the cable, thus obviating crystallization at the support.

Conductor Loops on Anchor Towers

Excessive spread on the ancher towers between the conductor ends on each side made the loop problem particularly important. The anchor towers are battered directly toward and away from the crossing, but not at all at right angles to the line. For structural reasons cable attachments are made at the legs and thus, in each circuit, in the same vertical plane on the side toward the crossing. On two of the towers appreciable angles exist between the line of the crossing and the adjacent portion of standard line. In the maximum case the angle is about 22.5 deg. On all four anchor towers wide, flat crossarms extend out on each side to support the connecting loops between Copperweld and copper conductors by means of two, or on the lower arm, three strings of insulators each.

Tests on an experimental set-up, with the distances laid out, confirmed the conclusion that the 500,000-circ.-mil copper cable alone would not be safe for use in swinging loops. Rather than attach small truss members to the cable the stiffening is obtained by threading the cable through copper tubing. The horizontal sections are bent at the ends to approximately correct alignment, but simple ball-and-socket joints serve to connect this portion to those covering the inclined portions of the loop. The tubing is carried from the standard clamp on the copper cable to the point of attachment of the loop on the Copperweld cable. The ends of the tubing are held to the cable of the loop by a simple centering clamp which prevents displacement of the tubing along the cable. The appearance of the loops and dead end strings may be noted in the view from between the circuits shown in Fig. 6.

Structural Features of a 459-ft., 220-kv. Double-Circuit Transmission Tower

By Walter Dreyer

Assistant engineer, Civil Engineering Division, Pacific Gas and Electric Company, San Francisco

PRELIMINARY studies resulted in fixing the type of cable and in establishing the general configuration to be used for the two principal river crossings on the Vaca-Dixon-Contra Costa 220-kv. transmission line. With the type of cable and its elastic and thermal properties determined, the next step was the calculation of the proper sags and corresponding stresses in the cable. A maximum stress of 21,800 lb. was permitted in the conductor under the very remote conditions of a temperature of 25 deg. F. and a wind pressure of 14 lb. per sq.ft. of projected area of cable. With this stress existing under extreme weather conditions it was necessary also to calculate the sag which would

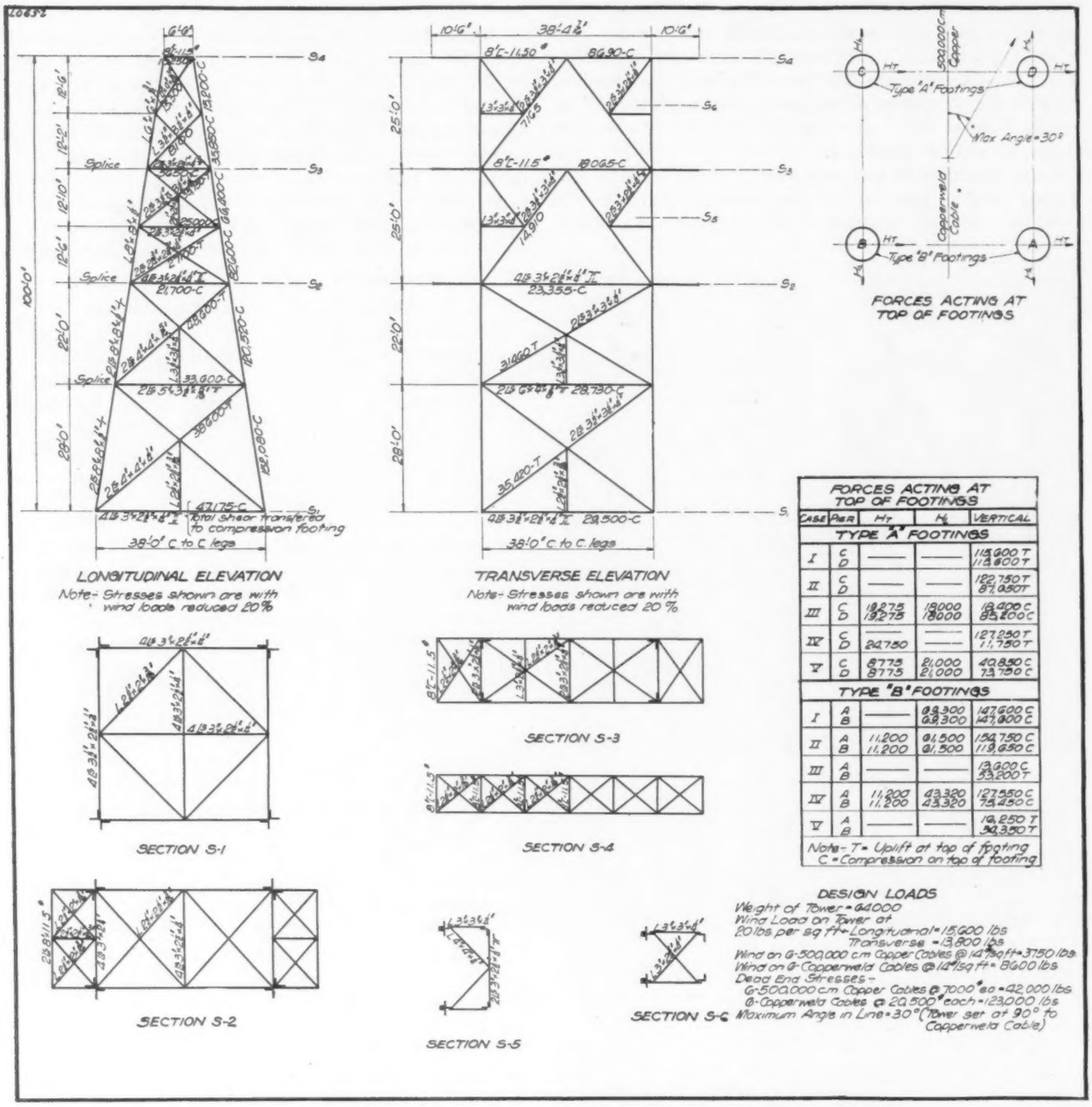

LONGITUDINAL ELEVATION
Note- Stresses shown are with wind loads reduced 20%
TRANSVERSE ELEVATION
Note- Stresses shown are with wind loads reduced 20%
FORCES ACTING AT TOP OF FOOTINGS
Type 'A' Footings
Type 'B' Footings
Max Angle = 30°
Copperweld Cable
500,000 c.m. Copper
FORCES ACTING AT TOP OF FOOTINGS
TYPE 'A' FOOTINGS
TYPE 'B' FOOTINGS
Note- T = Uplift at top of footing
C = Compression on top of footing
SECTION S-1
SECTION S-2
SECTION S-3
SECTION S-4
SECTION S-5
SECTION S-6
DESIGN LOADS
Weight of Tower = 64000
Wind Load on Tower at 20 lbs. per sq. ft. = Longitudinal = 15,600 lbs
Transverse = 13,800 lbs
Wind on 6-500,000 c.m. Copper Cables @ 14 lbs/sq.ft. = 3750 lbs
Wind on 6-Copperweld Cables @ 14 lbs/sq.ft. = 8600 lbs
Dead End Stresses -
6-500,000 c.m. Copper Cables @ 7000 lbs ea. = 42,000 lbs
6-Copperweld Cables @ 20,500 lbs each = 123,000 lbs
Maximum Angle in Line = 30° (Tower set at 90° to Copperweld Cable)

Fig. 1. Stresses resulting in anchor tower from assumed loads given in adjacent text.

occur on a quiet summer day with no wind blowing and a temperature of 130 deg. F. in the cable. This latter condition results in the greatest sag and determines the height of towers required to maintain the specified clearance over the river channels. The result of this study early determined that the structures required at the Sacramento River probably would be the highest towers ever used for transmission purposes. The three towers at the San Joaquin River are of lesser height, but with the exception of the base details are of the same design as the upper portion of the higher Sacramento River towers.

Loads for Design

The low anchor towers are designed to withstand safely the following loads:

Weight of 6 cables plus insulators	23,000 lb.
Weight of tower	64,000 lb.
Transverse wind on 6 cables and insulators at 14 lb. per sq.ft.	12,400 lb.
Wind load on tower at 20 lb. per sq.ft.	15,600 lb.
Tension from 6 cables at 20,500 lb.	123,000 lb.

The high crossing towers are designed to withstand safely the loads shown below. It may be noted that provision is included for dead-ending any one wire on the cage of the tower. Allowance also is made for the slightly unbalanced loads that may accrue due to temperature changes in the catenary which will deflect the insulators in a longitudinal direction.

Weight of 6 cables plus insulators	69,000 lb.
Weight of towers	405,000 lb.
Transverse wind on cables taken at 45 deg. to line	14,400 lb.
Wind load on tower, taken at 20 lb. per sq.ft. (for the 459-ft. tower)	108,000 lb.
Unbalanced load due to any one cable at 20,500 lb. plus 5 remaining at 1,000 lb. each	20,500 lb.

Stresses in the structure resulting from these loads and the sizes of members required are shown in Fig. 1 for the ancher tower and in Fig. 2 for the highest crossing tower.

Allowable Stresses in Members of Towers

Allowable stresses adopted for designing the structure are the values recently recommended by the American Institute of Steel Construction. For convenience in applying these formulae the wind load of 2 lb. per sq.ft. of projected area of tower and 14 lb. per sq.ft of projected area of cable have been reduced 20 per cent. This was done instead of the usual method of permitting combined dead, live and wind load to exceed by 33⅓ per cent the stresses given by formula. In view of the fact that wind stresses are relatively larger in towers than in buildings, only 20 per cent reduction instead of the 33⅓ per cent customary in building and bridge practice was permitted.

Design Features of Towers

It was decided early that the towers would be of conventional double-circuit construction owing to the economy inherent with that type of structure. Configuration of the cage therefore was determined by the length of insulator strings, the lateral deflection of insulators and cable under wind load, and the specified clearance of 7 ft. between the cable and any part of the tower. These factors resulted in adopting a vertical separation of 25 ft. and a horizontal separation of 37 ft. as compared with 15 ft. and 24 ft. respectively on the standard construction. The middle arm is extended 6 in. beyond the lower and the upper arm is extended 6 in. beyond the middle arm in order to permit the lowering of any cable at a future date without the cables rubbing on each other as they are moved. The base width of the towers was determined by trial, choosing the dimension which gave the least tower and foundation cost.

In addition to making the tower adequate for strength, it was necessary to provide certain conveniences for making the tower accessible and for permitting men to work on the crossarms, over 400 ft. above the ground. The first was accomplished through the medium of a stairway instead of the customary ladder, and the second by making of each crossarm a platform with solid floor and railing. In addition to the three crossarm platforms a fourth was added below the lower arm so that insulators and hardware could be detached and lowered a short distance to men in close contact with those on the crossarm above.

Anchor towers are constructed entirely of angle sections, some members being tied together by lacing. The entire structure is galvanized and all field connctions are bolted. The crossing towers are galvanized and have bolted joints in the upper portion, which extend 49 ft. below the cage. In that section the tower members are quite generally angles. The lower part of the towers is composed of built-up members, usually laced channels for compression members and angles tied with batten plates for the tension members. This part is, of necessity, shop rivited and therefore painting rather than galvanizing is relied upon for preservation of the steel.

Tower Foundations

Soil conditions at the tower foundations are of three general classes. The two towers north of the Sacramento River are located on clay or hardpan strata. The two towers south of the San Joaquin River are founded on sand or sandy loam. Foundations for these four structures therefore are of simple design. Each pier is designed with sufficient weight to resist the maximum uplift with a safety factor of 1½.

Between the Sacramento and San Joaquin Rivers, however, the foundation material is not so satisfactory. The delta land is made up of very fine silt together with decayed vegetable matter or peat which has gradually consolidated until it is capable of supporting light loads. This formation varies in depth across the delta and timber piles varying from 30 to 80 ft. in length were required to support the towers. The anchor towers as located must resist in addition to the vertical loads a horizontal pull exceeding 60 tons due to the dead-end tension of the cables. Bases of these towers therefore were designed to transmit all of this shear to the compression footings, and the piling was inclined so

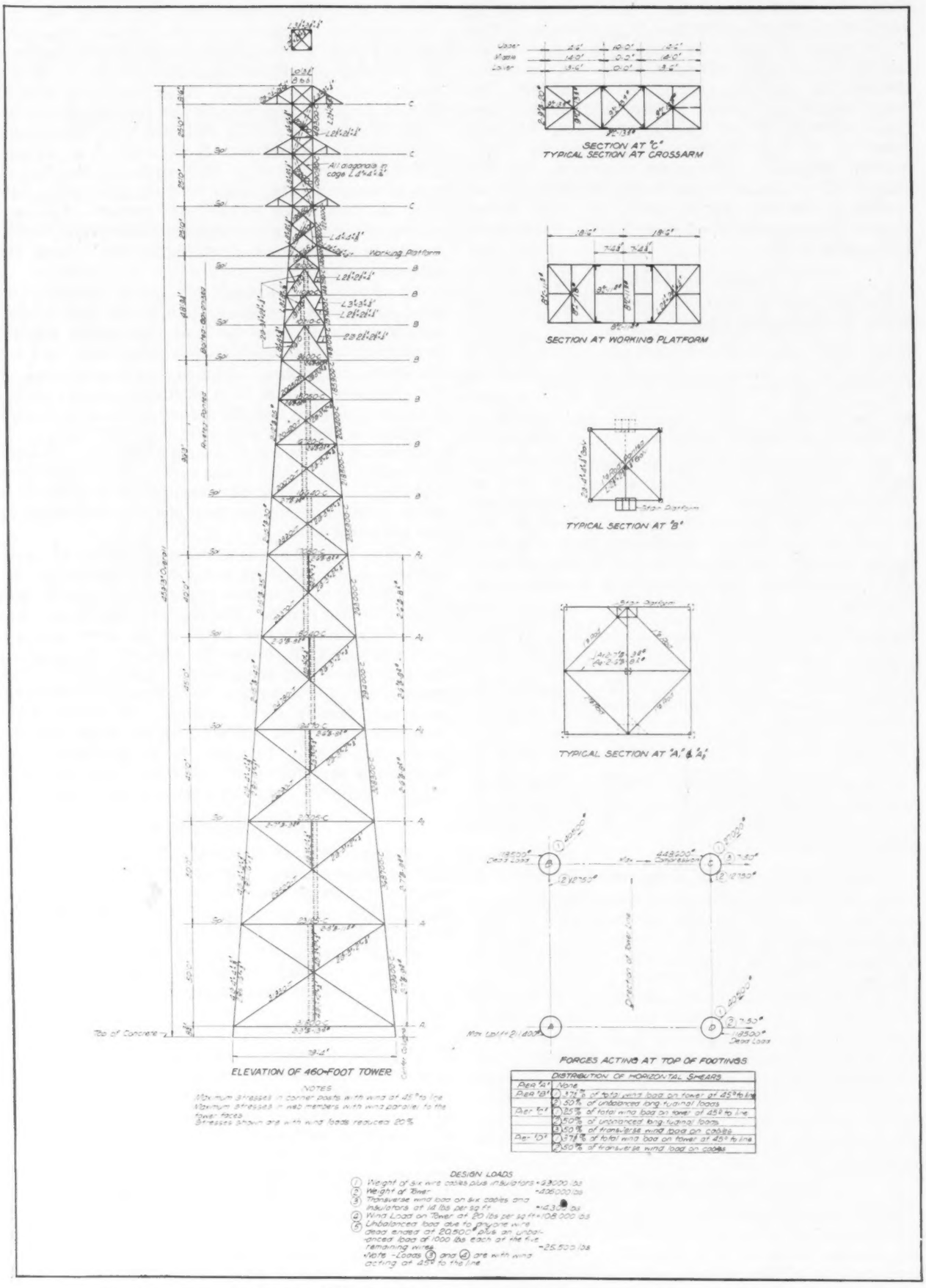

SECTION AT "C"
TYPICAL SECTION AT CROSSARM
SECTION AT WORKING PLATFORM
TYPICAL SECTION AT "B"
TYPICAL SECTION AT "A" & "A1"
ELEVATION OF 460-FOOT TOWER
FORCES ACTING AT TOP OF FOOTINGS
NOTES
Maximum stresses in corner posts with wind at 45° to line.
Maximum stresses in web members with wind parallel to the tower faces.
Stresses shown are with wind loads reduced 20%
DISTRIBUTION OF HORIZONTAL SHEARS
Per "A": None
Per "B": 37½% of total wind load on tower at 45° to line; 50% of unbalanced long. tuminal loads
Per "C": 25% of total wind load on tower at 45° to line; 50% of unbalanced long. tuminal loads; 50% of transverse wind load on cables
Per "D": 37½% of total wind load on tower at 45° to line; 50% of transverse wind load on cables
DESIGN LOADS
1. Weight of six wire cables plus insulators = 23000 lbs
2. Weight of Tower = 426000 lbs
3. Transverse wind load on six cables and insulators at 18 lbs per sq ft = 142300 lbs
4. Wind Load on Tower at 20 lbs per sq ft = 108000 lbs
5. Unbalanced load due to ground wire dead ended at 20,500# plus an unbalanced load of 1000 lbs each at the five remaining wires = 25500 lbs
Note — Loads 3 and 4 are with wind acting at 45° to the line.

Fig. 2. Stresses in highest (459-ft.) crossing tower resulting from loads given in adjacent text.

that it lay in the direction of the resultant of the vertical and horizontal loading. The inclined piling was put down to the same depth as the vertical piling, driven to the penetration required by the Engineering-News formula, since it was felt that no reliance could be placed upon a formula for inclined driving.

Physical Data on Towers

Weights, concrete quantities, and number and length of wood piles required to construct the towers at the two main river crossings are shown in Table I, following.

TABLE 1—Data on special towers for Sacramento and San Joaquin River crossings of Vaca-Dixon-Contra Costa 220-kv. transmission line.—Material quantities for one complete tower.

Type	Tower	Location	Weight Steel (Tons)	Concrete Foundations (Cu. Yds.)	Piles Length (Ft.)	Piles Number
100 ft.	Anchor	North Bank-Sacramento	31	139	– None –	
100 ft.	Anchor	South Bank-Sacramento	31	139	66-78	16 Battered 16 Vertical
100 ft.	Anchor	North Bank-San Joaquin North Channel	31	139	68-75	16 Battered 16 Vertical
100 ft.	Anchor	South Bank-San Joaquin	31	139	– None –	
459 ft.	Crossing	South Bank-Sacramento	202	270	56-67	75 Vertical
410 ft.	Crossing	North Bank-Sacramento	167	331 (Special deep footings)	– None –	
359 ft.	Crossing	North Bank-San Joaquin	154	251	29-37	59 Vertical
314 ft.	Crossing	South Bank-San Joaquin	133	231	– None –	
269 ft.	Crossing	North Bank-San Joaquin North Channel	113	250	44-51	55 Vertical

Construction Features Involved in 220-kv. Crossing Over Navigable Streams

By E. H. Steele

Engineer of Line Construction, Pacific Gas and Electric Company, San Francisco

AFTER the design of any undertaking has been completed by the engineers the construction man's troubles begin. It is with a view toward pointing out a few unique features involved in erecting towers and stringing cables on towers up to 459 ft. in height that this article is written.

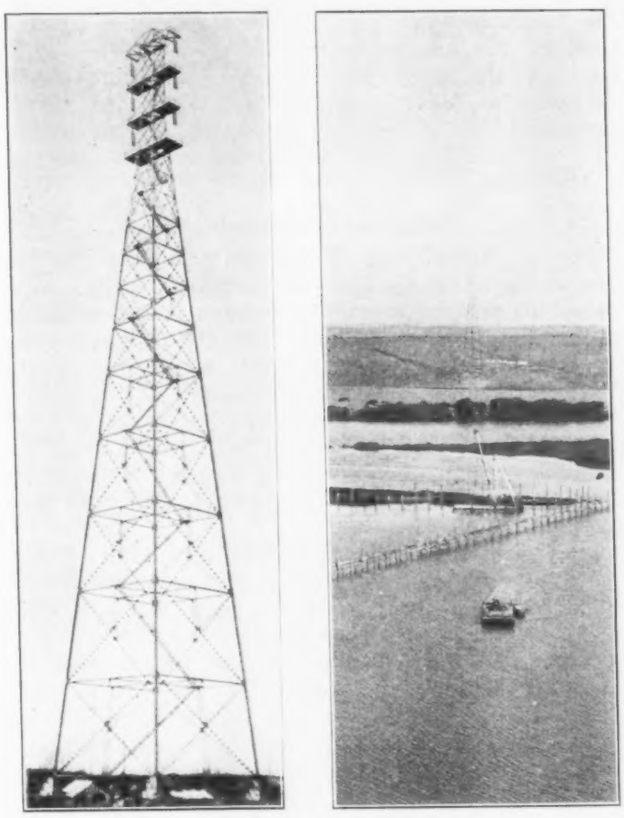


Fig. 1. Completed high tower (left). Note comparative size of construction camp at base of tower. Looking north across the Sacramento from the high tower (right). Note obstructions that had to be crossed in stringing cables.

Foundations and steel erection did not involve any special problems and therefore will not be dwelt upon except to state that, because of the great height of the towers, equipment had to be used in proportion to the weight of members involved in the erection of this steel. So far as the procedure was concerned, however, the general practice followed in the erection of ordinary steel towers was employed. In the stringing of the cables on these towers, however, several special problems arose which had to be worked out. The features of these will be dealt with more specifically.

It should be appreciated that from anchorage to anchorage the distance is approximately 1¾ miles; that each cable was in one continuous piece; that the actual weight of each length of cable was approximately 10 tons; that the supports for the cable on the high towers were working in tension rather than compression, and that several natural as well as artificial obstructions were in existence within the spans involved. All of these had to be given careful consideration before the work could be organized and a start made.

Procedure of Stringing

From the profile shown in Fig. 3 on page 370 it may be noted that a narrow strip of land, known as West Island, divides the San Joaquin River into two channels. This is a natural obstruction to an easy procedure with the stringing of the cables since it was desirable to anchor the working barge with its reel of cable at one of the river banks in order to carry the first end to the nearest anchor tower by means of running lines. With the cable anchored at that point it would have been ideal to proceed across the strip of water with the barge, paying the cable out into the stream and after landing at the farther shore, there to remove the unused portion of cable from the reel, laying it out in the form of a figure 8, either on the working barge or at a convenient point near the shore and thus permit the second end of the cable to be fastened to the second anchor.

As the working barge could not be passed around West Island it was anchored on the south bank of the island in the San Joaquin River proper. The storage barge, which was a derrick barge used for loading and unloading as well as for the storage of copper, was located on the south bank of Curtis Island in the north channel. Working lines then were carried between the working and storage barges and between the storage barge and the anchor tower on Curtis Island. With the working lines in place the main cable was unreeled across West Island, North Channel and Curtis Island to the anchor tower. After the main cable had been made fast at that point sufficient slack was pulled into the main cable to allow for lifting it to its final position on the towers adjacent to the North Channel.

The working barge then was towed across the main San Joaquin River, laying the cable in the stream in the manner employed with a submarine cable. After landing at the opposite side of the stream the balance of the cable was paid off the reel and carried to a convenient sand bank at the shore line. There it was placed in the form of a figure 8 to gain access to the end at the center of the reel. After the end was reached the main cable was carried ahead toward the second anchor tower, leaving sufficient slack to permit raising the cable to its proper position on the supporting tower at the south bank of the San Joaquin River. The cable then was fastened at Anchor Tower No. 1, still resting on the channel bottom between these towers.

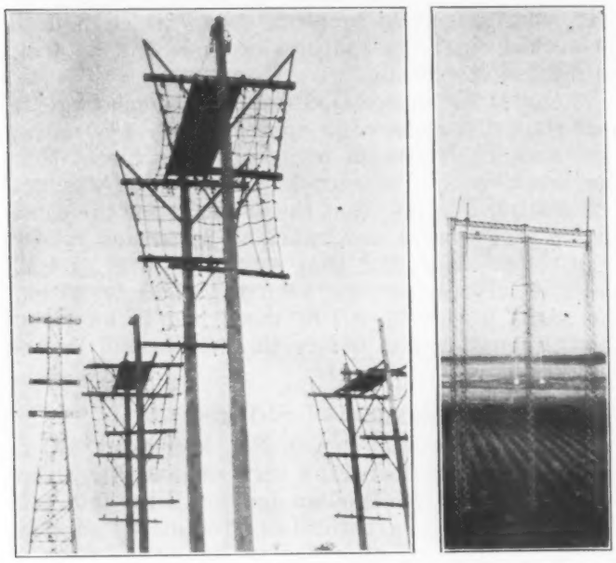


Fig. 2. Protective "baskets" over low-voltage lines (left) and over high-voltage lines (right) to prevent cables falling into live lines.

With the main cable in that position the cable did not reach within 1,800 ft. of the second anchor tower.

A 3-drum hoist of sufficient capacity was stationed back of the second anchor tower and to this hoist the main pulling lines were attached. These were led out over the anchor tower to the end of the main cable and the cable was pulled through its various snatch blocks out of the river bed and clear of shipping. It was necessary to carry on this work without obstructing traffic on the river. The hoist, on a direct pull such as this, was able to bring the cable to a tension between 8,000 and 9,000 lb. Tension on the main cable then was transferred to triple-sheave blocks. The line passing through

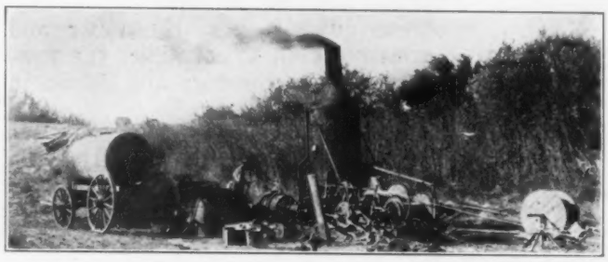


Fig. 3. Three-drum steam hoist used in pulling cables into place.

these blocks was fastened to a second drum of the pulling hoist and the main line again pulled until it was brought to final tension and subsequently fast at the second anchorage, just in front of the pulling hoist.

In addition to the natural obstructions in this crossing there were two circuits of the Great Western Power Company's 110-kv. transmission line to be crossed on Curtis Island, as well as 4-kv. and 11-kv. lines of the Pacific Gas and Electric Company, the Great Western's 22-kv. line, telephone and telegraph lines and the Santa Fe railroad track between the high supporting tower on the south bank of the San Joaquin River and the second anchor tower on the main line. Work had to be carried out without interfering with the service in any of the power circuits, communication circiuts or the railroad.

Details of Methods

Fig. 2. shows some of the characteristic protective bridges, or baskets as commonly called, designed to protect the lower voltage power circuits and communication circuits. The lattice steeel-pole structure shown is protecting the two 110-kv. Great Western circuits previously mentioned. Although it cannot be seen in the photograph there is a network of flexible cables running both parallel and at 90 deg. to the main cables being strung. This made it impossible for a cable, if broken, to fall onto the live circuits.

Fig.1 is given an aeroplane-like view taken from the tower on the south bank of the Sacramento River. This shows the working barge being towed to the south bank with a reel of cable after the end of that cable had been made fast to the anchor tower on the mainland some 1,900 ft. back of the high tower which may be seen in the background. The working position of the anchor barge also may be noted as well as the natural obstructions in the river channel, all of which had to be crossed. These obstructions included a dredge pipe-line, a small island and a dyke. The distance from the tower on which this picture was taken to that in the background was 4,135 ft.

Sheaves and bridle used in carrying the cable from the ground to the supporting position on the high towers is shown in Fig. 5. The sheaves in this rig were more than 2 ft. in diameter and their distance apart was so determined as to provide sufficient

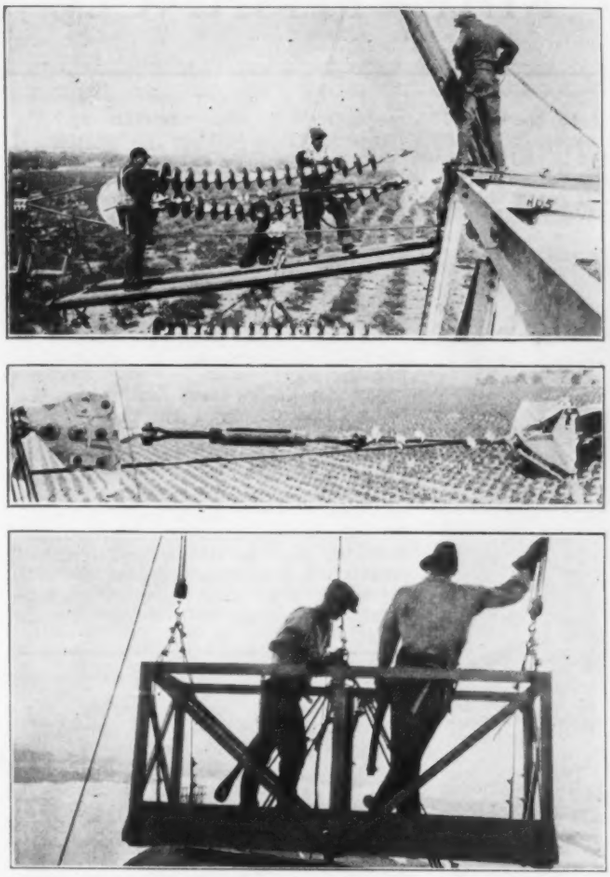


Fig. 4. (Lower) working chair used for linemen in handling suspension strings. (Center) dead-end hardware partially assembled. (Top) dead-end assembly partially completed; note that the insulator strings are raised into position on a special cradle so that all the line crew has to do is attach the links at each end of the string. A string is shown just being raised into position.

working room to insert the permanent saddle supporting the cable. Arrangements also provided for local adjustment of the bridle to facilitate the work of the linemen in attaching the insulators.

Fig. 4 shows the working chair used to lift linemen to the proper position to make fast the temporary supports and also to transfer the cable from its tempirary to its permanent position. This ring was very carefully designed not only for lightness but for strength and security, bearing in mind that the men had to work in these chairs at a height of more than 400 ft. from the ground.

A suspension string of insulators in position on one of the high towers is shown in Fig. 5. The cable had just been placed in its permanent saddle at the lower end of the strings, and the men were in the act of releasing the turnbuckle to transfer the cable weight from the temporary supporting sheaves.

Hardware assembly at a dead end before placing the insulators in position but after the cable had been pulled to tension appears in Fig. 4. The turnbuckle, it may be noted, was inserted in order to complete the assembly; to maintain the proper dis-

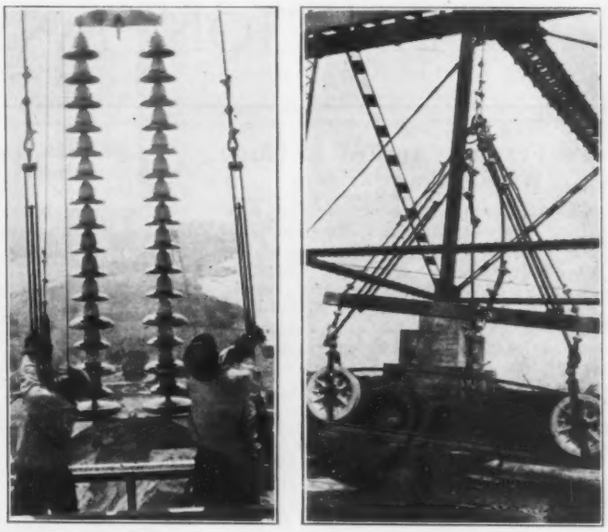


Fig. 5. Sheaves and bridle with cable in place ready to be raised to the top of a tower for attachment to the insulator assembly (right). Cable in position (left) and linemen easing away on bridle to transfer strain to cable support on insulator strings.

tance between the upper and lower ends of the assembly; and to make such adjustments as were necessary to permit inserting the insulator strings.

A portion of the derrick placed on top of one of the dead-end towers is shown in Fig. 4 (upper). This was used in lifting the hardware assembly into position, a single assembly weighing more than 1,500 lb. This illustration also indicates very much in detail the working platform which was designed to support the workmen during the time they were inserting the insulator strings in the dead-end assemblies. This working platform was supported on the anchor tower on one end and on the main cable at the other. At the extreme left of the picture may be seen the trolley chairs which were used by the workmen in going out on the cable to make up the dead-end clamps. Also, just under the working platform, is shown a string of insulators being raised to position on a special frame designed for that purpose so that they could be lifted in a horizontal position. The strings were too long and too heavy to be otherwise handled by the workmen, but could be inserted readily in place with little difficulty by this means.

It is noteworthy to state that this work was accomplished without a single serious accident. The stringing of the cables including time occupied in getting the equipment together consumed a period of six weeks, the schedule which was allotted to the job before it was commenced. The line was placed in service on Friday, Sept. 17, and now is regularly carrying power between the Vaca-Dixon substation and the Contra Costa substation as a major part of the network of transmission lines of the Pacific Gas and Electric Company.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

New Features Applied to Large Wilson Transformers

Of particular interest at the new Wilson substation, the transmission tie-in point between the systems of the San Joaquin Light & Power Corporation and the Great Western Power Company, is the bank of 30,000-kva. transformers. This bank is composed of four 30,000-kva. G.E. units operating at 60 cycles, is Y-connected on both sides, and rated 220/125 kv. Also there is provided adelta tertiary winding of sufficient capacity to supply the 25,000-kva. synchronous condenser.

Natural cooling is sufficient to take care of capacities up to 57 per cent of the rated capacity of the bank. For greater loads additional cooling is provided by air jets from a system of piping so arranged that the air in immediate proximiity to the cooling vanes is kept in positive motion as long as the air system is in operation. These particular pipes may be discerned in Fig. 1 which is a reproduction of a snapshot of this bank. From this illustration it may be noted that there is a main air header completely encircling the base of the transformer. From this header there is a branch supply pipe each side of each cooling wing supplying air to lateral pipes. These lateral pipes are pierced with two series of holes so that a jet is blown upward and downward from each pipe impinging upon the vanes at a flat angle.

This air circulation system is based upon a low pressure rather than a high pressure. Experiments proved that a gentle draft of air from these spray pipes was sufficient to keep in motion the air adjacent to the vanes. A high-pressure system involved a greater expenditure of energy in air supply and accomplished practically no better results. Air for the bank is supplied by a blower located a few feet from the transformer bank and connected to each transformer header through an underground duct. A 35-hp. blower does the trick.

Height from ground to the top of the transformer is in excess of 28 ft. The weight of each unit is 130 tons.

A range of taps in the common high-tension winding provides for a voltage delivery of from 105 to 125 kv. on the low-tension side. A buffer winding is placed between the 125-kv. sections, and the whole tap section is protected at each end by electrostatic shields. However, an analysis of the design showed that the capacitance of these electrostatic shields would not be sufficient to relieve the ratio adjuster of potentials that might be difficult for it to withstand. Therefore it was necessary to increase the capacitance between the tap terminals and across the ratio adjuster in order to decrease the transient voltage incident to tap changes. This was accomplished by the installation of a 3-electrode condenser. The middle electrode of this condenser is connected to the common point of the ratio adjuster and the other two electrodes of the condenser are connected respectively to the maximum and the minimum taps. Thus no matter in what position the ratio adjuster may be, there will be a capacitance connected across the tap portion of the winding involved; that is, a capacitance from the incoming line to the tap. By this expedient the tap portion of the winding is brought instantaeously to a potential approximately uniform regardless of the tap to which the ratio adjuster happens to be connected. This interior arrangement is shown in Fig. 2.

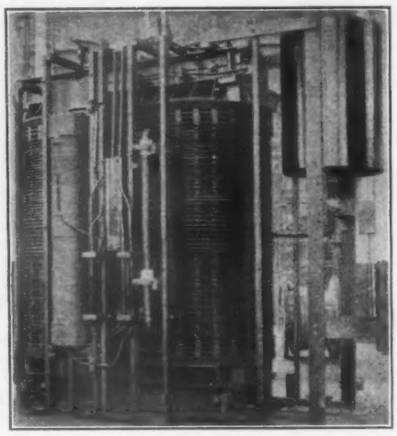


Fig. 2. Interior of one of the 30,000-kva. Wilson transformers showing the installation of condenser.

Another interesting feature of the Wilson installation is the 110-kv. type FHKO-39 high-speed oil circuit breakers. These breakers are operated by the new motor-driven centrifugal mechanism, the operating characteristics of which seem to be much more desirable than those of solenoids. The installation in this particular case makes practical the synchronizing of the two power systems through the high-tension circuit breakers.

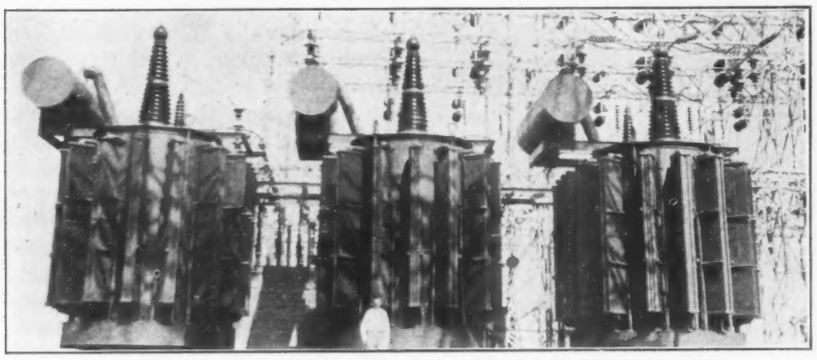
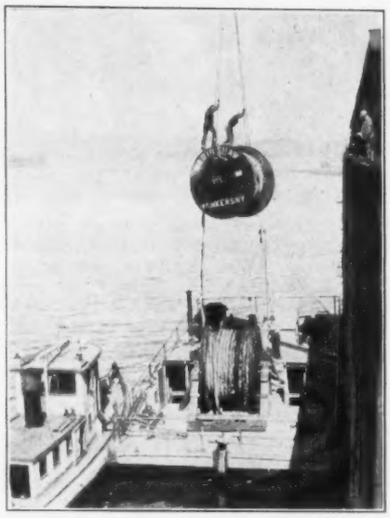


Fig. 1. Bank of 30,000-kva., 125/220-kv. transformers at Wilson substation of the great Western Power Company. Comparative size is well indicated by the presence of J. M. Renfrew of that company's electrical engineering department. Mr. Renfrew stands well over six feet.



Unrolling a reel of 400,000-circ.-mil, 11-kv., 3-phase cable upon the deck of a cable barge preparatory to laying it across the Willamette River from Columbia Street to East Clay Street, Portland, Ore. The cable belongs to the Portland Electric Power Company and the laying job was done by the Pacific Telephone & Telegraph Company. With one reel of the cable coiled in a figure 8 on the barge deck and the second reel mounted as shown, the 600-yd. laying job was done in a total elapsed time of seven minutes. The cable weighs 26 lb. per ft.

Power Factor Correction for Individual Motors.—Further advance in the study of the causes and correction of poor power factor is evidenced in the announcement of the Westinghouse company that static condensers in sizes of from ½ to 5 kva. are now in production for that application.

IDEAS FOR THE CONTRACTOR

Sacramento Elks Lodge Equipment Well Planned

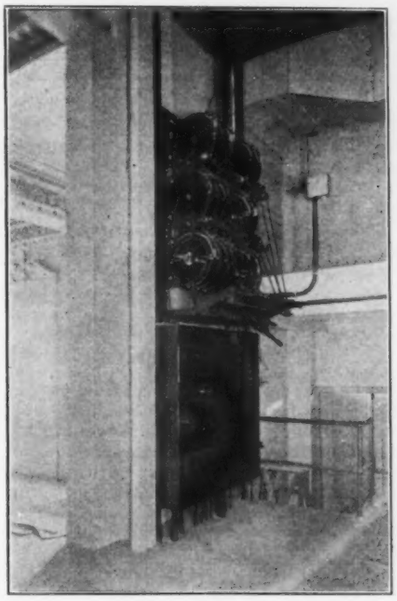
Fixtures Especially Beautiful and Stage Lighting Control Possible by Means of Complete Dimming System

The new 14-story Elks building in Sacramento, Calif., finished not long ago, contains a number of electrical features to make it one of the most up-to-date buildings of its type in California.

The fixtures used for lighting throughout the building are unusually beautiful, having been designed especially for the building by Mr. Bernhardt. The fixtures were manufactured by the Boyd Lighting Fixture Company of San Francisco.

To control the lighting of the lodge room, Cutler-Hammer dimmers are installed; these control the lodge room fixtures and lighting over the tapestry panels. These tapestry panels are illuminated by means of troughs located at the top of each panel. A stereopticon lens in the ceiling space illuminates the clock located in the lodge room.

A Wurlitzer electric organ is installed in the lodge room. The keys of the organ operate relays which in turn operate the pipes of the organ.



Stage and auditorium lighting controlled by means of dimmer banks in the Sacramento Elks building.

In the ball room located on the second floor dimmers are installed on all of the ceilings, as well as for the foot border lights of the stage at one end of the hall. Master dimmers control the foots of red, white and blue as well as two borders of red, white and blue. Floor sockets (Major) are installed on the stage. A Major outlet is also installed on the balcony for the use of a moving-picture projector.

Outlets on the veranda of the building are wired with water-tight plugs to provide for lamps used during summer evenings.

Kitchen Equipment

The kitchen connected with the dining room is especially well equipped

Beautifully designed fixtures used in ballroom of Sacramento Elks building.

electrically. A Hobart food grinder and cutter is in use in the kitchen. This is a mechanically and electrically interlocked machine. The interlock on the food grinder consists of a tumbler switch interlocked with a mechanical lock. When the electric drive is on the mechanical cannot be operated. This prevents the knife housing from being raised. A Hobart mixer is also used. Vapor-proof fittings are installed in the range hood to provide electric lighting over the range. A Crescent electric dishwasher is in operation and electric waffle irons and toasters are used.

Elevator service is provided by two Spencer-Westinghouse passenger elevators; telephone service comes in through a PBX board. An electric clock system extends throughout the building, operated from a Standard Electric Time Company master clock.

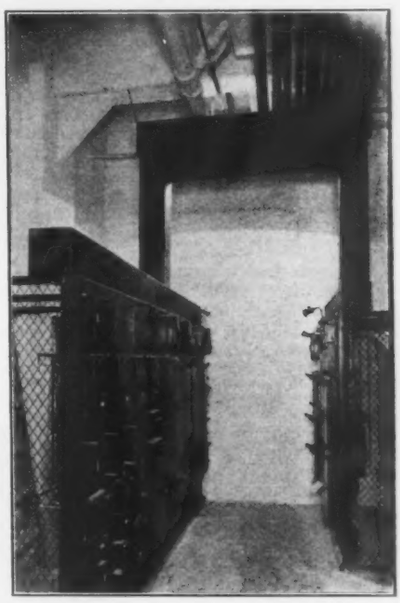
Basement Equipment

The sub-basement under the building contains the circulation pumps and filters for the swimming tank, the condensation pump and also a sump pump. The main switchboard located there is split; one board being used for lighting only, which service is supplied by the Pacific Gas and Electric Company, and one for power only, supplied by the Great Western Power Company. The pumps for the house service connect to the city mains.

Three supply fans and one exhaust fan are used to ventilate the building. All of the air which is circulated throughout the building is washed and may also be heated. Fans in various parts of the building take care of local ventilation, in addition to the general ventilating system.

Exterior Lighting

Originally the finial on top of the building was designed for copper but was changed to glass in order to provide for illuminating effects. This finial is 6 ft. high and hexagonal in shape, 24 in. in diameter running up to a pyramid. It is wired with three circuits of red, white and blue, and so connected that any or all of them



Panel controls for building light and power, Sacramento Elks building.

may be used at one time. There are 120 50-watt lamps installed in this location.

The electrical installation was made by Latourette-Fical Company, Electragists of Sacramento. F. O. Hutton, Elks building engineer, designed the installation.

Radio Installation Rules Issued in New Code Booklet

One of two handbooks of the Bureau of Standards, namely, No. 9, just off the press, sets forth safety rules governing radio installations. This booklet is a part of the latest revision of the National Electrical Safety Code, now being issued in separate parts and later to be printed in combined form. The official summary of the booklet is as follows:

Handbook No. 9 contains safety rules governing radio installations. It will be found of value to owner and operators of transmitting stations and to the general public, because it contains many valuable rules for the installation of receiving equipment. Among these may be mentioned the following:

Antenna supports must be sufficiently rigid and of such size as to withstand any load which may come on them. Attachment to chimneys should be avoided. Metal poles or masts extending more than 10 ft. above the supporting building must be permanently and effectively grounded.

Locations involving crossings over railroads, supply lines, etc., should be avoided, but where no other location is possible special rules are given for the installation.

In the case of receiving stations, lead-in conductors shall be not less than No. 14 not less than No. 17 A. W. G. (0.045 in.) if made of bronze or copper-covered steel. Clearances are given between lead-in wires and other conductors on the building and it is recommended that lead-in conductors be "securely fastened in a workmanlike manner. The code also requires that the lead-in wire shall enter the building "through a rigid, non-combustible, nonabsorptive, insulating tube or bushing, or through a drilled window pane."

For receiving stations, grounds must not be made to gas pipes, but should be made to cold-water pipes, if these are connected to a street main. An outlet pipe from a water tank fed by a street main or a well may be used, provided such outlet pipe is adequately bonded to the inlet pipe connected to the street main or well. Where the wire is attached suitable clamps must be used, and the entire surface of the pipe covered by the clamp must be scraped clean.

Rules for the application of protective devices, such as lightning arresters, and antenna grounding switch are also given. Each lead-in conductor for a receiving station must be provided with a lightning arrester, whether or not an antenna grounding switch is used. The arrester may be either outside the building or inside, if away from the combustible materials.

If a receiving set is connected to a power supply line, the device used and methods of wiring must be in accordance with the rules covering permanent or portable fixtures, devices, and appliances as given in section 37 of the National Electric Safety Code. The wiring of storage batteries must tlso conform to these rules, and such batteries must be placed where there is adequate ventilation.

Wall type electric ranges make available more kitchen space.

Medford All Electric Apartments Bring Advance Demand

Complete electrical equipment for the new Schuler apartments of Medford, Ore., recently completed, resulted in the fact that practically every apartment in the building was reserved before the building was completed.

The new structure represents an investment of nearly $100,000 including building, grounds and equipment. It is situated at the corner of Sixth and Oakdale. The apartment building contains 25 apartmcnts which are electrically equipped throughout. Some of the outstanding features include the individual electric ranges, electric refrigerators and radio receptacles with which every apartment is equipped.

The electric ranges are of the Standard built-in type, occupying very little space in the kitchen. A small Frigidaire electric refrigerator is also part of the regular equipment.

The recently built Schuler Apartments at Medford, Ore., completely equipped electrically.

Electric Laundry for Tenants

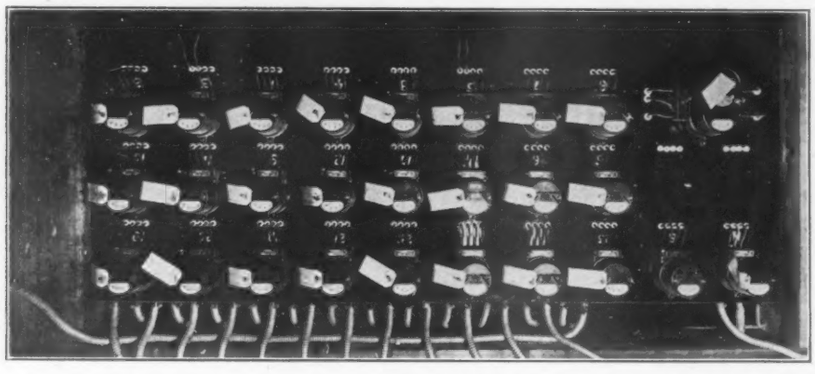
The individual radio connections are directly connected with a large central receiving set located in the basement and operated by the management. In the basement also is an electrically equipped laundry room for the use of the tenants as well as a storeroom containing private lockers for each apartment. Automatic electric elevators are provided also.

Convenience outlets for small electrical appliances are numerous and the lighting fixtures are said to be of the most modern design.

The type of electric refrigerator installed in each apartment.

A large single board in the basement provides a place for the individual meters serving each apartment. A tag on each meter designates to which apartment the service is rendered.

The People's Electric Store of Medford, Ore., were the electrical contractors in charge of the job.



Meter board containing individual meters for all apartments of the Schuler apartment building. Individual tags on each meter label the service to which the meter belongs. Flexible metal conduit was used for wire runs.

Denver New Electrical Rules Under Advisement

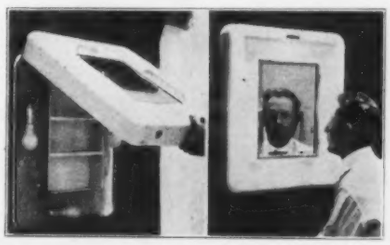
The proposed new electrical working rules for the city of Denver which were prepared by a local committee representing every branch of the electrical industry, have been submitted to city officials for approval. According to an opinion expressed by the city building inspector who is reviewing the work, his examination will be completed within a short time and the manuscript will then be referred to the original code committee for such changes as may be recommended.

Contrary to the belief held in some sections, the purpose of the committee has not been to establish a new electrical ordinance but rather to prepare new electrical working rules which may be enforced under the present ordinance which gives power to the city electrician to make such rules and regulations from time to time as he may deem necessary.

Contractor Designs Electric Mirror for Shaving

W. B. Holland, proprietor of the Holland Electric Company, at 177 W. Center Street, Anaheim, Calif., is the inventor of an ingeniously lighted shaving mirror and medicine cabinet for use in homes.

It is an all-metal cabinet, finished in



Concealed lamps in the frame of this all-metal medicine cabinet provide illumination to all sides of the face for shaving. It was designed and patented by W. B. Holland, Electragist of Anaheim, Calif.

white porcelain. Four lamps are concealed on the inside of the cabinet around the frame holding the mirror. The light is thrown on all sides of the face after passing through diffusing glass. The mirror acts as a door to a regular medicine cabinet.

The device is patented by Mr. Holland, Electragist of Anaheim. Photographs showing the arrangement of lamps and the effect produced are shown on this page.

Writer Explains Criticism and Offers Apology

A criticism made to a representative of the Journal of Electricity concerning statements contained in one of the "Electrical Estimating for the Contractor" series, namely No. V, published Nov. 1, 1925, pp. 340, 341, was referred to the author of this series, J. R. Wilson. The criticism was made that in Fig. 1, a 1-in. conduit with No. 6 rubber-covered wire was shown for connections to a 20-hp. motor when electrical safety orders call for 1¼-in. conduit. Also in the schematic diagram of power wiring for the American Hardwood Company, on p. 341, 1-in. conduits and No. 6 wires are shown, where 1¼-in. are called for in the safety orders; where 1¼-in. conduit and No. 2 wires, the conduit should be 1½-in. and where shown as 1¼-in. and three No. 2's, it should have been 1½-in. and three No. 2 wires.

In answer to these criticisms Mr. Wilson wrote as follows:

In answer to a criticism which has reached the writer, the tables of allowances for Los Angeles differ somewhat from the allowances given in the state safety orders. The tables are those used for the installation of conduits and wires in Los Angeles as allowed by the local code rules.

The particular criticism referred to herein pertains to the article appearing Nov. 1, 1925, which described an industrial installation made under supervision of the writer. As the preliminary estimate was submitted against price competition it is but natural that advantage was taken of the local code allowances so that this estimate would be in line.

The same crieicism previously had been called to the writer's attention by Mr. Evans of the Board of Underwriters of the Pacific. At his request many of the later articles carried the line "Los Angeles Code." The writer is extremely sorry if the article first mentioned has led to confusion.

J. R. WILSON.

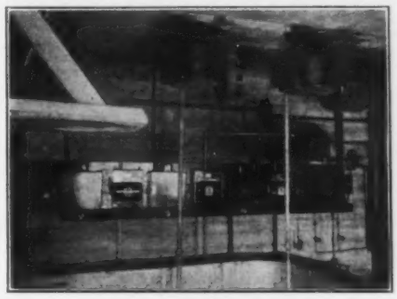
Governor Operates Control on Newspaper Compressors

A departure in control methods was made by C. C. Clardy, San Diego Electragist, not long ago, in the installation of equipment to operate air compressors used in connection with the newspaper plant of the San Diego Union and Evening Tribune.

Three 35-cu.ft. compressors are used, connected to type C.P.I. General Electric Co. 3-phase, 220-volt motors of the interlocked type. An M.L. General Electric railway governor operates the control circuit which in turn operates the magnetic switch. Double-throw switches allow operation either on the governor or the whole battery of compressors. The control circuit is wired so that any individual compressor may be thrown on or off. This is valuable from the reliability standpoint, particularly when one governor or compressor is not being used or is being repaired. Each compressor is equipped with a dirt collector.

An automatic release relieves the pressure in the cylinder while starting. This is operated by solenoid, interlocked with the control circuit. The switch at the left in the photograph is a magnetic switch.

A gutter was installed because of the accessibility and because it improved the looks of the installation. Three compressors are installed. One is used as a standby. The compressor used as a standby is rotated in order to equalize the amount of service on each compressor.



A railway governor operates the control circuit in this installation of air compressors in a San Diego newspaper plant.

The installation was designed and installed by C. C. Clardy, Electragist of San Diego.

Question Box

Arrangements have been made to answer through the columns of the Journal of Electricity such questions on electrical construction and other subjects as are of general interest. Inquiries should tricity, 883 Mission Street, San Francisco.

Q. 7. What is the formula for expressing power lost on d.c. lines?—M.T.C.

A. $W = C \times I$

Where: W = watts
C = volts drop
I = current flowing

Q. 8. What are weights per mile of No. 8 to No. 14 T.B. weatherproof iron wire?—J.A.K.

A. No. 8, 470 lb. (average). No. 9, 400 lb. (average). No. 10, 350 lb. (average). No. 12, 230 lb. (average). No. 14, 150 lb. (average).

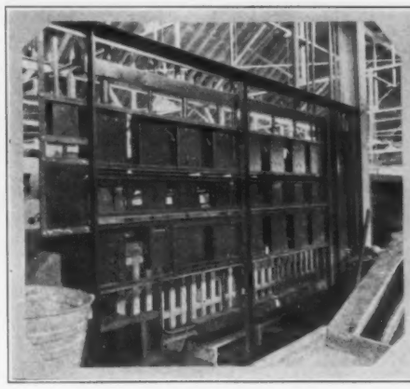
Q. 18. What solution can be used in a home-made polarity indicator?—E.S.G.

A. Iodide of potassium dissolved in glycerine.

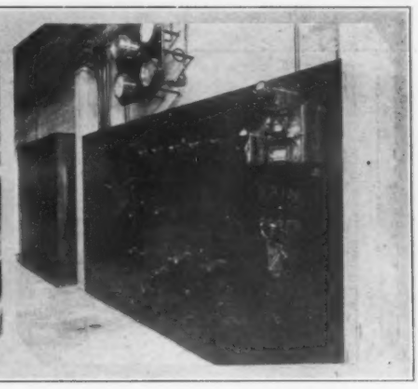
Walled-in Switchboard Allows Access from Rear

Although seemingly imbedded in the wall of concrete, a recent installation of a distribution switchboard made by the Granger-Dacus Electric Company, Electragists of Ontario, Calif., for the West Ontario Citrus Association, is well provided for easy access as well as for future growth of the electrical demands of the association.

The distribution panel in this installation was made of heavy angle iron. An opening was left in the concrete wall to accommodate the main distribution board. An iron door on the rear made of 14-gage iron allows the power company to test without interrupting the service. The doors open toward the back. Space was left in making the original installation to take care of future additions to the plant. This will be seen in the picture. The board faces the engine room and really fits in between walls so that the rear of the board is in the adjoining room.



Heavy angle-iron framework of distribution panel before the wall was poured around the board.



Completed board and wall. Access to rear of the board is possible from the adjoining room, allowing tests without interrupting service.

Answers to Questions on N.E. Code

Q. Is it a violation of the National Electrical code to use an E condulet as an entrance fitting if properly installed?

A. A conduit fitting which has been listed as "standard" by Underwriters' Laboratories and is of a type similar to that known as an "E condulet" may be used as a conduit service entrance fitting if installed so that the porcelain cover is on the lower side and the wires are in a vertical position where entering the cover. However, for the larger sizes and where conductors are not stranded, to prevent possible abrasion of the wire insulation and covering it is preferable and advisable to use a fitting of a type having a removable cap which permits the wires to be drawn into the conduit easier and with less likelihood of injury to the wire covering.

Q. Order 716-4-a of the Electrical Safety Orders calls for all conductors on the outside of signs to be installed in rigid metal conduit or in weatherproof metal wireways. Some inspection departments are permitting a short piece of open wiring extending from the conduit or metal raceway to the sign letter and others insist upon the conduit or raceway extending into the letter, which involves quite a job in the repair of a letter. In the case of a roof sign the short pigtail can be cut, the letter removed, lowered to the roof, repaired, and then replaced. Otherwise it involves a soldering job to open the letter so it can be removed and another to replace it, which has to be done on the frame supporting the sign letters.

A. The above method of connecting to the individual letters on signs is approved by this department if the outlets are properly bushed and assembled, so that rain water will not enter the sign letters or the conduit, and the taps are made as short as practicable.

Q. Does all power wiring, regardless of voltage, have to be installed in conduit?

A. Electrical Safety Orders 711-4 (a) and 711-2(b) require all low potential motor installations to be made in conduit (rigid or flexible), metal armored cable, metal raceway, or metal gutter with the following exceptions:

(1) Where the difference of potential between any two conductors of the circuit does not exceed 300 volts and the conductors are not larger than No. 10, knob and tube wiring may be used in concealed locations; but in such cases the wiring from the outlet to the motor and control equipment shall be in conduit, metal armor, metal raceway, or metal gutter, as above required, unless the omission thereof is permissible under the following exceptions:

(2) Metal armor will not be required on the flexible portable conductors to portable motors operating at not not over 600 volts to ground. In all cases the flexible cable or cord used shall be of a type specially approved for use under the conditions to which it will be subjected.

(3) In substations, motor wiring may be installed in compliance with the requirements for the protection of conductors, as given in the orders applying to substations.

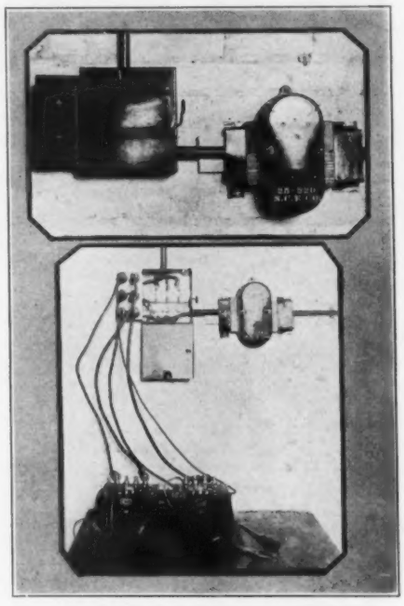
(4) Open wiring may be used for motor wiring when the voltage does not exceed 600 volts and the conductors are not smaller in size than No. 0, subject to the restrictions of Order 703-10.

Cotton Raisers Find New Use for Electric Light.—Since cotton is now to be considered as one of the regular crops of San Joaquin and Imperial valleys, a new use for electric lighting may be of interest and profit to electrical contractors operating in such territory. J. A. Partridge, a cotton raiser near Tornillo, Texas, has devised a way of ridding his fields of the ravages of the cotton moth. Electric lights have been strung along each row of his cotton plants. At night these are illuminated and the light attracts countless millers. The millers strike the lights and fall into cans containing kerosene conveniently placed beneath each light. Thus the millers are exterminated before having a chance to lay the eggs from which are hatched the worms that destroy the leaves of the cotton plant. The idea holds possibilities for use in combating other forms of insects also.

Vault Telephones Required in Chicago.—Telephones will soon be installed in every bank vault in the city of Chicago if an ordinance recently introduced into the city council is approved. The action was taken because of a recent accident in the city hall building when a clerk was locked in the basement vault for several hours and was almost suffocated before he was released by a night watchman after frantic pounding on the door of the vault. Had there been telephonic communication with the outside office, his release would have been immediate.

Permanent Test Terminal Board Prevents Test Shutdowns

Although the central station cannot require that the consumer install such equipment, the use of a safety switch with permanent test terminal board installed adjacent to it has many advantages from the consumer's viewpoint. Such equipment was worked out by W. R. Frampton, superintendent of the test department of the Southern California Edison Company.



Top: Test terminal board installed adjacent to safety switch. Bottom: Test being made of lines without shut-down or danger.

The permanent test board permits the central station test man to run a test on a consumer's meter without interrupting his service; in effect it permits the test man to shunt the current through the test meter by merely placing the meter in the line.

This apparatus was developed at a time when there was no similar apparatus on the market which would permit the central station man to run a test on a consumer's meter without shutting down the consumer's plant or subjecting himself to possible serious electrical shock and burns.

As a rule the installation of this equipment in any particular location has been borne by the consumer. In saving the customer the necessity of interruption the cost of the installation is to his own advantage.

Santa Cruz, Calif., at a meeting of the city council recently, adopted a new electrical ordinaice by unanimous vote. The new statute increases the annual license for persons engaged in the electrical contracting business from a previous figure of $25 to a yearly fee of $100 and provides for the appointment of a city electrical inspector. The ordinance was supported by the electrical contractors of the city.

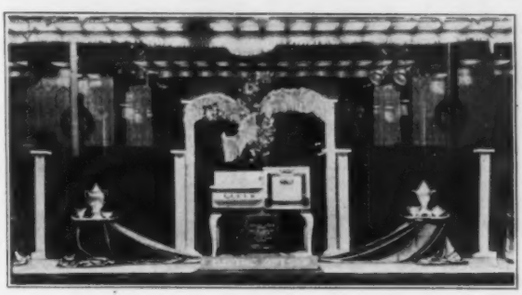
The San Francisco Electrical Contractors' Association has just put out in loose leaf form a complete topical index of local, national and safety orders codes and furnished to all members of the association.

Christmas decorative lighting is now practiced by a number of oil companies. This picture is of an elaborate and effective job of decorative lighting used by the Shell Oil Company at its Fell and Stanyan Streets service station in San Francisco last year. Such installations provide attractive seasonal business.

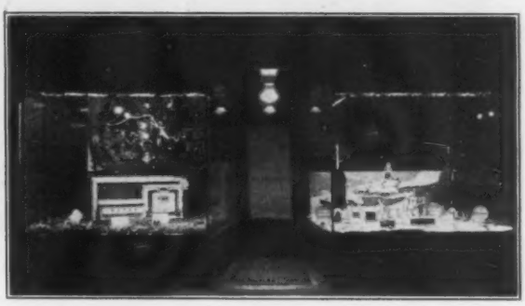
GIVE ELECTRICAL CHRISTMAS GIFTS

Better Merchandising

BUY ELECTRICAL GIFTS FROM ELECTRICAL STORES



With spot-lighting upon the range and percolator sets, this window of the Utah Power & Light Company, in Salt Lake, carries the idea, "The Electric Gift Shop."



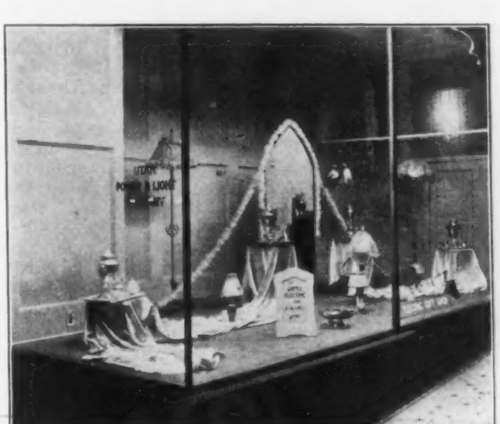
Out of the Christmas box comes the electric range in one window of the Logan, Utah, office of the Utah Power & Light Company. The other window contains a variety of gifts.

The chimney and fireplace give the right holiday touch to the window of the Lushington Electric Company of Seattle.

Christmas

season of gift giving, is the electrical merchandiser's great opportunity of the year. How you may conduct successfully this year's campaign, based upon the successful methods of others last year, is set forth in these pages.

Simple and dignified in the extreme, is this striking window of the Public Service Company of Colorado.



An unusually attractive display of percolator sets, waffle irons and lamps in the Salt Lake City office of the Utah Power & Light Company.

With the display card bearing "Give Something Electrical" J. J. Agutter & Company of Seattle, Wash., made an effective display of appliances and Christmas tree lamps.

Nothing is so conducive to holiday shopping as a well decorated display room. In the picture on the left may be seen the decorations employed to good effect by the Utah Power & Light Company in its Salt Lake office. At right is the Valley Electrical Supply Company, Fresno, in its Christmas gaiety.

Christmas Ideas That Have Paid Dividends

Are you organized for Christmas selling? Naturally Christmas is the season for greater appliance sales. But greater appliance sales require greater advertising effort. Moreover the rush of business at such a time is apt to leave the unprepared merchandiser very much up in the air on many occasions.

Be prepared for the Christmas season's merchandising. Check over these very necessary selling preparations. If you are set on all of them you can feel sure that 1926 will be a merry Christmas season for you.

Stock—Placed your orders yet? Estimated your requirements on sound lines?

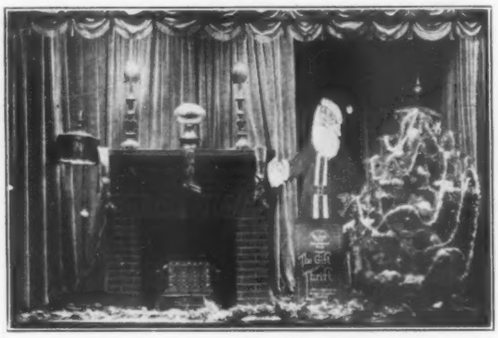
Help—Have you enough help to care for customers? Does the help know the stock?

Leaders—Have you planned leader articles at reduced prices to bring customers to the store?

Advertising—Planned your advertising yet? Check mailing lists, plan newspaper ads, broadsides, pamphlets, catalogs, stickers. Have you looked over dealer helps offered?

Displays—Decorated the store in festive dress, or planned to? Use light! You are selling light. Set an example. Make your store the city's one bright spot. Change your windows frequently. Make them sell for you.

Deliveries—Offer your customers Christmas Eve delivery. You can build up a strong good will on first class delivery at this time. Use decorated wrappings, too. They all have a telling effect.



That a customer-ownership share of stock makes an ideal Christmas gift is set forth in this well arranged window of the San Joaquin Light & Power Corporation.

Some of the following Christmas ideas may prove to be just the things you want. They have been successful selling methods in the past. If you can put some of them to work for you they should be equally successful in your territory.

The Electrical Gift Idea—How Shall It Be Sold?

By J. U. BERRY, Advertising Manager, Valley Electrical Supply Company.

If there is any season of the year when electrical merchandise can be advertised and displayed most profitably, certainly it is at Christmas time, and the merchant who is handling electrical goods is overlooking a great opportunity when he fails to put his store in the Christmas atmosphere. No truer statement was ever made than, "Goods well displayed are half sold." Gift seekers in increasing numbers each year are carefully selecting gifts that will be of lasting usefulness. Electrical things are practical, labor-saving and most attractive. With all these in our favor, the big problem then is to give the store the Christmas atmosphere so the spirit of Christmas will be reflected to those who enter.

In planning our holiday activities, the thought uppermost in mind was to sell the electrical idea to the entire community so thoroughly that all who handle electrical merchandise might profit by our advertising and displays. Thousands of the power consumers of this district entered the store every day; not all of them bought electrical gift merchandise from us, but we feel safe in saying that many thousands had the desire created in their minds who afterwards bought elsewhere. The substantial increase in November and December business was ample justification for our efforts and expenditures.

Artistic Decoration with Christmas Greenery

Hundreds of yards of natural greenery was festooned from column to column and around the sides of our lobby. Tinsel and icicles were artistically arranged on the greenery which had already been sprayed with white, giving it a

This booklet is worth $11.25
SAVE IT!
Santa goes shopping for
GIFTS
ELECTRICAL
$5.00 on the Westinghouse Waffle Iron No. 449000
$2.25 on the Thermax Cooker
$1.50 on the Thermax Percolator (1956)
$1.50 on the Westinghouse Curling Iron
$1.00 on the Thermax Toaster

Cleverly written and illustrated gift catalogue in which coupons are given for credit exchange on leader articles, is this booklet of the Pacific Power & Light Company. The booklet contained short descriptions of numerous appliances, together with illustrations in two colors, and gave prices of each of the articles.

very realistic frosted appearance. Large red Christmas bells were hung where the festooning crossed. A large 20-ft. Christmas tree was placed in the center of the lobby to the front, all glistening with tinsel, ornaments and colored lights.

Every foot of open window space was used to display electrical merchandise. On each unit display neat hand lettered show cards were used suggesting gifts. Back of the windows were visible at close range show cases also trimmed with Christmas tinsel and colored roping and acting as a second series of small display windows. Hundreds of people each evening parked their cars in front of the building and spent much time wandering around examining the various displays of electrical goods.

In the Radio section the front cases are the "open front notion drawer" style where all small radio parts are in plain sight of the radio fans. These, too, are displayed so as to promote Christmas buying.

Aside from the windows and interior displays, practically every avenue of advertising approach was employed. Liberal newspaper space was used, direct mail, house to house circularizing and bill-board advertising. Even our delivery and service cars carried gift suggestion signs.

Gift Catalogue and Free Coupons Assist Sales for Pacific Power & Light

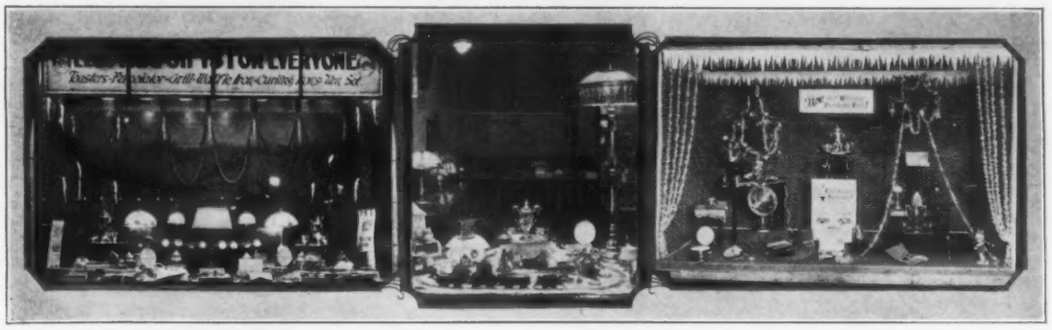
WHEN all possible electrical gifts are set forth in an attractive little catalogue, and that catalogue contains a number of coupons good for credit on certain leader articles, the Christmas appliance selling problem is in a fair way to being solved. Such at least was the experience of the Pacific Power & Light Company throughout its territory in Oregon and Idaho last year.

A well arranged pamphlet, of a size to fit into the ordinary envelope, was sent to all customers of the company. On its cover, decorated with holly and in two colors, was the admonition, "This booklet is worth $11.25. Save it!" Within, its 24 pages were devoted to short but tempting descriptions of each of the various appliances available as Christmas gifts. Each appliance was illustrated by means of a small picture or drawing. Prices of each of the articles and of the various types, were given. The headings were printed in red ink, while the descriptions and pictures were in green ink.

A double page spread in the center of the booklet featured the Westinghouse waffle iron upon which there was to be found at the back of the book a coupon entitling the purchaser to $5 credit. Among the items listed in the catalogue were Christmas tree lamps; breakfast sets of toaster, percolator, creamer and sugar bowl; traveling iron sets, grilles, waffle irons, electric ranges, headlight heaters, curling irons, heating pads, toasters, percolator sets, oven cookers, cigar lighters, washing machines, irons, ironers, portable lamps of many kinds, and vacuum cleaners.

The last page consisted of five coupons, each one good for a specified amount in payment for a specific electric appliance listed in the catalogue. These coupons proved to be the effective touch which kept the catalogue from going the way of all such literature, into the wastebasket. Experience proved that the catalogue was kept in the household and that many sales were traceable directly to the coupons. Those who came in to buy the featured appliance for which the coupon was given as part payment often decided upon other grades of merchandise. Many who came to buy only the "special" bought other appliances as well.

The catalogue idea is by no means new or untried. Millions of dollars worth of merchandise are sold every year by means of catalogues. The mail order houses demonstrate this fact. The electrical merchandiser can well afford to borrow this well established advertising method from the mail order house and turn it into cash.



A well balanced display (left) in the windows of the Ogden, Utah, office of the Utah Power & Light Company. Center: an attractive small window display at the Park City, Utah, office of the same company. At right is one of the windows used throughout the territory served by the Pacific Power & Light Company, of Portland, Ore., during its Christmas campaign.

Airplane Brings Santa Claus in Colorado

Broadsides and Gift Certificates Distributed from Airplane Boost Sales Throughout Territory

INTRODUCING Santa Claus to the populace via the airplane route and bombing seven cities in northern Colorado with cash and merchandise gift certificates, the western sales division of the Public Service Company of Colorado scored what is popularly termed a knockout in the way of an advertising novelty just prior to Christmas last year.

This deft stroke of unconventional publicity bordering on the realm of the circus stunt turned an immediate profit in electrical merchandising and brought inestimable dividends in institutional advertising.

It was the feature number of several sales maneuvers that assisted the division in breaking all records for total merchandise sales during one month. Not only was a new high mark set, but it was hung up among the clouds, exceeding by over 50 per cent the best previous total in the same territory. December likewise drew down the curtain on a record year.

Santa Rides His Air Sleigh

Leaving Denver under the hand of a professional flyer, the plane winged its way northward on Dec. 19, covering the cities of Boulder, Longmont, Loveland, Berthoud, Louisville, Lafayette, Windsor and Fort Collins, making a landing at the last named place.

Riding in the forward cockpit and garbed in traditional Kris Kringle fashion was Virgil Stone, employee of the company's budget department. Describing three circles over each city visited, the aviators dropped specially prepared broadsides devoted to the holiday merchandise offered by the local sales offices of the company.

Each of the pieces of advertising literature was separately folded. Attached to a certain number of them were certificates entitling the receivers to percolator sets, electric curling irons or other articles of merchandise when presented at the local office of the Public Service Company. In addition, each broadside contained a cash certificate good for the amount stated if applied on the purchase of some electrical Christmas gift named thereon.

At Fort Collins, where a landing was made, Santa Claus repaired to the front of the company office. There from a box fashioned to represent a chimney, he drew forth 250 sacks of candy, distributing them to the children as they filed past him.

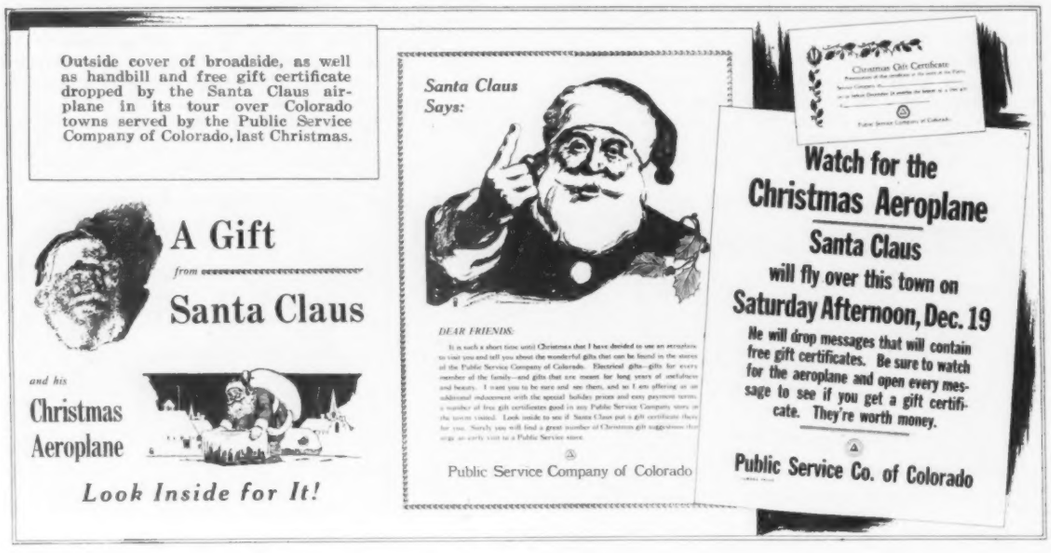
Despite Delay People Await Plane

The interest shown by the residents of the cities visited was beyond even the fondest hopes of the promoters of the flight. Virtually the entire population of each city turned out to watch for the plane and to scramble for the gift certificates.

It so happened that circumstances beyond the control of the company delayed the flight long after the time scheduled so that when they finally circled over the first of the cities on their route they were more than two hours behind time. Notwithstanding the delays, however, the people waited. In Loveland, where the plane was due shortly after noon, the streets in the business district were thronged to the point of congestion half an hour before the announced time of the plane's arrival. When it failed to put in an appearance, practically the entire assemblage waited.

Well Planned Publicity

Advance publicity on the stunt was started on Dec. 17, two days previous to the date scheduled. It consisted of a "teaser" advertisement in daily


Outside cover of broadside, as well as handbill and free gift certificate dropped by the Santa Claus airplane in its tour over Colorado towns served by the Public Service Company of Colorado, last Christmas.
A Gift
from
Santa Claus
and his
Christmas Aeroplane
Look Inside for It!
Santa Claus Says:
DEAR FRIENDS:
Public Service Company of Colorado
Watch for the Christmas Aeroplane
Santa Claus
will fly over this town on
Saturday Afternoon, Dec. 19
He will drop messages that will contain free gift certificates. Be sure to watch for the aeroplane and open every message to see if you get a gift certificate. They're worth money.
Public Service Co. of Colorado

Santa Claus arriving by airplane in the territory of the Public Service Company of Colorado. Thousands watched the skies for Santa upon the company's announcement. Broadsides and gift certificates were dropped from the plane.

papers in each of the cities. "Watch for the Christmas aeroplane Saturday afternoon, Dec. 19, 1925," was all that each display space contained.

On Friday the papers carried a news story announcing details of the plan. Most of them gave front page space with two-column heads. On the same day dodgers were distributed to each house in all the cities. Newspaper display ads likewise carried the detailed message of the flight. An average of 20 column inches was devoted to each display ad run the day before the flight.

As a simulus to Christmas business alone, the stunt was well worth while, to say nothing of its effect on future sales and its good will aspect.

Results Exceed Most Sanguine Hopes

For instance, in Loveland, a city of 3,500 persons which has a municipal lighting system, merchandise sales on the day of the flight totaled $1,000. The company recently contested the legal right of the city to establish its own plant and the feeling toward it was not supposed to be the best. However, the flight brought the people out in surprising numbers and practically all of them visited the company store and became either actual or prospective customers.

In Fort Collins the sale of three washing machines was traced directly to the fact that the buyers had brought their children to the store to receive free candy. In Boulder a man called at the store to look at a $1.98 lamp which he saw advertised in the broadside. He became interested in an electric suction sweeper and purchased it, leaving his check for $65 in addition to taking the lamp.

Cost Was Very Nominal

The cost of the stunt to the company was very nominal. Total outlay was approximately $355, or a little more than $50 to the city covered. The items of expense were compiled as follows: Aeroplane and pilot, $90; merchandise, $65; newspaper advertising, $65; printing of broadsides, dodgers and gift certificates, $61; clearing landing field at Fort Collins of snow, $15; candy, $30; miscellaneous, $30.

The cost of most of the merchandise given away was defrayed by manufacturers who cooperated on the plan. Chief among these were the Westinghouse Electric & Manufacturing Company, Mountain Electric Company, New Home Sewing Machine Company and the Automatic Electric Washer Company.

The idea was suggested by Ed. Rowland, manager of electric sales in the district. Details were worked out by him and E. K. Hartzell, in charge of publicity and advertising for the district. All copy, including news stories for the various papers, was personally prepared by the latter.

Good Will Results from Stunt

The enterprise is notable not only for its results, but also as demonstrating that even a staid, conservative organization can profit at times by overstepping established policies and adopting the spectacular and unusual in the way of a sales promotion scheme.

"The stunt was perhaps the most successful we have ever employed, considering the low cost and the outstanding results obtained," stated Rowland. "Also, as far as my knowledge goes, it was unique so far as central station exploitation is concerned."

There is yet another angle to be considered in summing up the results. An immense amount of good will for the company on the part of the merchants in the cities covered was harvested. By calling out goodly portions of the populations, business sections were crowded and retail stores in all lines handling gift articles reported sales far above normal for the day. A check showed that approximately 80 per cent of the gift certificates dropped from the plane were recovered and presented at company offices.

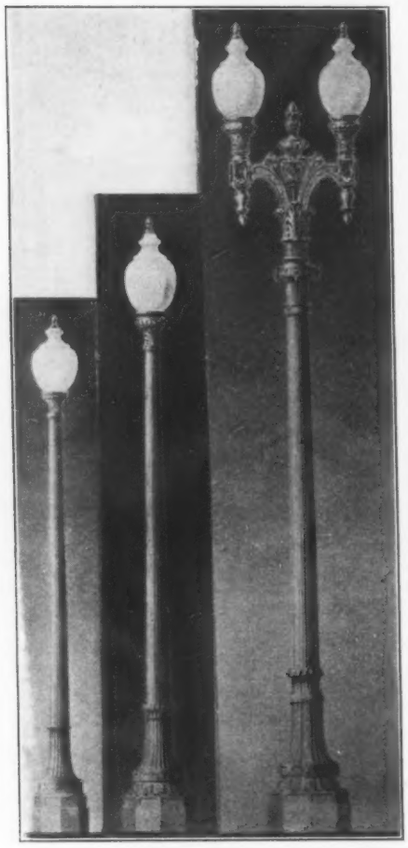
The Rocky Mountain section has made a great success of its outdoor Christmas decoration and illumination campaigns. This is the county hall of Boulder, Colo., and the city's official electrically lighted live Christmas evergreen tree.

NEWS OF THE INDUSTRY

Oakland, Calif., Plans Special Street-Lighting System

A resolution approving plans and specifications for a specially designed street-lighting system for the down-town district of the city of Oakland, Calif., recently was passed unanimously by the city council.

The plans provide for 353 steel ornamental electroliers, each to be equipped with two 1,500-cp. units, or a total of 3,000 cp. for each standard. Each 1,500-cp., 20-amp. series lamp will be operated from an individual lamp transformer in the base of the standard. Two of these individual lamp transformers will be in the base of each standard; they will insulate the standard from the high-voltage underground series circuit, and the only voltage above ground will be that of one lamp, which is less than 100 volts. All of the latest safety features have been incorporated in the specifications. The electroliers will be 20 ft. in height, and will be spaced 100 ft. apart.



Family of standards adopted by the city of Oakland, Calif., for a uniform street-lighting system.

The lighting system has been devised entirely by the city's electrical department, under the direction of Carl Hardy, superintendent, and in connection with it the family of standards shown in the accompanying photograph has been adopted for uniform street lighting. The two-light standards shown are the ones that will be used in the down-town district. The single-light standards will be used in future installations of ornamental lighting on residential streets, boulevards and secondary business streets. The standards will be manufactured in Oakland, and lighting equipment and glassware will be furnished by the General Electric Company.

After the customary meeting of the council to hear protests is held, bids will be called for and contracts awarded. It is expected that the system will be in operation within from six to eight months.

Plans Ordered for Modesto Irrigation District Substation.—Preparation of plans for the 9,000-kw. substation to be built by the Modesto Irrigation District has been ordered by the district. The station will handle the power received from the Hetch Hetchy plant of San Francisco under the terms of the recent agreement between that city and the irrigation district (Journal of Electricity, Nov. 1, 1926, p. 346), and will be built at a point in the district adjacent to the Moccasin-Newark transmission line.

Two Well Known Engineers Open Offices as Consultants

Under the name of Engineering Service Company R. W. Shoemaker and M. M. McIntire have opened offices at Room 518 Oakland Bank Building, Oakland, Calif., as consulting engineers. The firm is interested primarily in the industrial application of electricity and the municipally owned and publicly owned power and irrigation projects and in steam and hydraulic problems as well as electrical.

Both men are well fitted for the undertaking. R. W. Shoemaker, the senior partner, is a man of wide experience, both in California and in the Middle West in mine and power work. For the past four years he has been electrical engineer for the Turlock Irrigation District and at the same time acted as electrical engineer for the Merced Irrigation district during the construction of its Exchequer dam and power house. Mr. Shoemaker is a member of the American Institute of Electrical Engineers.

Mr. McIntire has been associated with Mr. Shoemaker as his assistant in the design and construction of two plants for the Turlock district and also the Merced district's plant. He was superintendent of construction for the Turlock district's La Grange plant and was superintendent in active charge of construction on the Exchequer plant of the Merced Irrigation district. Mr. McIntire is an associate member of the A.I.E.E.

California and Oregon Defeat Measures to Engage Them in Power Business

The voters of California and Oregon definitely have refused to allow those states to engage in the development and sale of hydroelectric energy.

For the third time the California Water and Power Act, the initiative measure designed to put the state in the power business, was defeated decisively at the general election held Nov. 2. Final returns have not been announced but as this paper goes to press the indications are that the majority against the measure will exceed 350,000, or a ratio of 2.5 to 1 as against 2.35 to 1 in 1924, and 2.45 to 1 in 1922.

In San Francisco the vote against the proposed amendment to the state constitution was 2 to 1, but it was more nearly 3 to 1 in Los Angeles where it was feared that the measure, if passed, would affect adversely the projected Boulder Canyon Dam.

Under the provisions of the proposed act the state would be bonded for $500,000,000 and a board of five members created with power to expend funds up to this sum for the purpose of acquiring or constructing power plants, transmission systems and distribution facilities for the sale of electrical energy to the public.

In Oregon the so-called Housewives' Bill, a proposed constitutional amendment designed for the same purpose as the California measure, was defeated by a vote of 4 to 1, according to latest reports, which give the figures as 35,465 for and 142,023 against. There was a marked similarity in the two measures, the principal differences being that the members of the proposed board of five were named in the Oregon act, that instead of stating a definite amount for the bonds it specified that bonds might be issued up to 5 per cent of the assessed valuation of the state, at the present time this 5 per cent amounting to $52,944,000, and that it stipulated that any expenditure of more than $500,000 for a single plant must be approved by the voters of the state at a general election.

State Engineer of Wyoming Is Elected Governor

Among the recent gubernatorial elections interest attaches to the fact that a state engineer was elected governor and a governor who had been a state engineer was defeated.

Frank G. Emerson, who has been state engineer of Wyoming for the past six years, was elected governor of that state, defeating Governor Nellie Tayloe Ross, while Gov. James G. Scrugham of Nevada, formerly dean of the college of engineering of the University of Nevada and state engineer during 1917-1923, was defeated by Fred Balzar. Governor Schugham served as Nevada agent and signatory to the Colorado River Compact.

In Arizona there is a possibility of a recount of votes for governor. Late press reports state that Gov. G. W. P. Hunt was leading his opponent by about 285 votes with approximately 90 votes in two counties unreported and a dispute centering around 100 votes credited to Governor Hunt. Governor Hunt, who has held office for several terms, has been the leader of Arizona's opposition to the Colorado River Compact.

Charges Against Utility Not Substantiated at Hearing

Branding the charge that the Portland Electric Power Company, Portland, had paid to the Portland Oregonian $35,000 to help defeat Senator R. N. Stanfield, independent candidate for re-election to the United States Senate from Oregon, as "an unqualified and outrageous falsehood," Edgar B. Piper, editor of the Oregonian, made a complete denial that that newspaper was connected in any way with such a transaction. Mr. Piper's testimony featured the first day of the investigation of the charge conducted by Senator Charles P. McNary of Oregon, a member of the senate investigating committee, at the request of Senator James A. Reed of Missouri, chairman of that committee. The hearing was held at Portland Oct. 27-28, 1926.

Further unqualified denial of the charge was made by Franklin T. Griffith, president, Portland Electric Power Company, Portland, and C. M. Clark, chairman of the board of the company, Philadelphia, who at the time the charge was made public, Oct. 25, were traveling together in California and who returned to Portland immediately to present their testimony at the hearing.

The investigation was ordered by Senator Reed on receipt of what appeared to be competent evidence furnished him by George Putnam, editor of the Capital Journal, Salem, Ore. Mr. Putnam has informed Senator Reed that he had good authority for the statement that the Portland Electric Power Company, through Mr. Griffith, had paid $35,000, of which $25,000 had come from the Philadelphia office, to the Oregonian in the interest of defeating Senator Stanfield and in behalf of the candidacy of Frederick Steiwer, regular Republication nominee. The hearing developed that the "good authority" was Walter Hayes, Washington, D. C., who was supposed to have brought the information to Salem and told it to Messrs. Putnam, Stanfield and others, and a conversation overheard in the coffee shop of the Davenport Hotel, Spokane, in which James Stone, manager, Spokane Gas & Fuel Company, Spokane, was alleged to have repeated a substantially similar story to a luncheon companion. Neither Mr. Hayes nor Mr. Stone were able to be present at the hearing, but telegrams received from both by Senator McNary and read into the record of the hearing made sweeping denials of knowledge of any such conversations as were credited to them.

Bungalow-Type Substations for Residential Sections

The first two of the bungalow-type substation for residential sections have been placed in service by the Southern California Edison Company. This new bungalow-type is of Spanish architecture, finished in white stucco and with a red tile roof over a portion of it. The high-voltage equipment is outdoors but is surrounded by a high wall which gives the impression of being part of the house and of having a flat roof. The roofed portion of the structure contains the 4-kv. switches, regulator and other equipment.

One of the new substations is Ramona and is located near the southern boundary of the city of Alhambra, serving a portion of that city and also the city of Monterey Park. The other is Charnock substation, which serves a rapidly growing territory between Santa Monica and Culver City.

These two substations are practically identical, each having a capacity of 1,500 kva. Each is fed by two 16-kv. circuits which enter the building underground. The three 4-kv. feeders and a controlled street-lighting primary leave underground from each station. All 4-kv. equipment is automatic reclosing. At present there is only one regulator for bus regulation; later, however, more circuits can be added and a regulator provided for each circuit, if desired.

The new substation in Pomona also has been placed in operation recently. Although situated in an industrial section of the city, a very pleasing building of buff brick with a red tile roof houses the 4-kv. equipment and 11-kv. metering and controls. The 11-kv. switches and transformers are outdoors. At present the station has a capacity of 3,000 kva. and can be fed from four 11-kv. circuits. There are four 4-kv. outgoing feeders which are separately regulated, and one two-schedule control primary for street lights. All circuits into and out of the station are underground for some distance. The 4-kv. circuits are planned in such a way that the present underground will be a part of the system which is to be constructed in the business district in the near future.

Supreme Court to Review Chelan Condemnation Proceedings

On application of the Chelan Electric Company, Chelan, Wash., which is preparing for the construction of a large hydroelectric power project on the Chelan River, a writ of certiorari has been issued by the state supreme court for a review of the water rights adjudication proceedings in the Chelan County court, in which Judge W. O. Parr denied the application for condemnation and dismissed the proceedings. The proposed power project is to furnish a large part of the power for the Great Northern Railway in the electrification of its new tunnel through the Cascades. The Chelan court is directed by the order to certify a transcript of the records and proceedings in the case to the supreme court on or before Nov. 20.

The company brought the action against Oscar Getty and other persons and corporations owning land along Chelan Lake and River, seeking the right to condemn land to permit its being flooded in the impounding of waters of the lake and river to a height of 700 ft. above sea level. The superior court on Sept. 25 held that as only 15 per cent of the power to be generated by the power project would be employed in public use the electric company was not entitled to adjudication on the ground of public use and necessity.

Entire City Made Into District for Lighting Purposes

The citizens of Oceanside, Calif., a city of less than 5,000 population, have made a lighting district of the entire city in an effort to light it in a way that apparently they were not able to finance through the regular tax fund.

A contract has been entered into with the San Diego Consolidated Gas & Electric Company to install 142 600-cp. series incandescent street lamps. This will provide a 600-cp. lamp at every street intersection in Oceanside, except in the ornamental lighting district where 56 400-cp. units have been installed. Approval of this assessment arrangement was general among the citizens of the city, as was evidenced by the fact that not one protest was made against the plan. The cost to property owners for the work is a little less than four dollars per lot per year, the average lot being 50 x 150.

Other extensive improvements are under way in the city, including a new $100,000 pier and promenade along the ocean front for a distance of approximately a mile and a half. On the prominade sixty 400-cp. ornamental lighting standards will be installed.

A group of Red Seal homes being built in a residential tract west of Twin Peaks in San Francisco by A. J. Herzig. Eventually there will be in that particular district one hundred and fifty Red Seal homes, of which Mr. Herzig is building twenty.

Fifth Transbay Cable Laid by Great Western Company

The fifth submarine cable of the Great Western Power Company of California across San Francisco Bay was laid Oct. 14. This 11,000-volt cable, stretching from Pier 39 in San Francisco to Point Isabel on the Contra Costa shore, is 41,000 ft. long, is 4¼ in. in diameter and has a capacity of 12,000 kw. The cost of the cable and the necessary equipment and tie lines at each shore end is estimated to be more than $275,000.

The cable, manufactured by the American Steel & Wire Company, was shipped to San Francisco from the factory in the East in eight cars, and upon arrival was spliced into one length and placed upon a barge preparatory to its being laid.

McGraw Awards to Manufacturer and Jobber Announced

The James H. McGraw manufacturers' medal and purse for 1926 was awarded to Clarence L. Collens, president, Reliance Electric and Engineering Company of Cleveland, at the recent meeting of the Apparatus Division of the National Electrical Manufacturers' Association. The award was conferred upon Mr. Collens for his services as president of the Electric Power Club in effecting a solution of the long-standing controversy over temperature ratings in electric motors and in reconciling this adopted standard with the viewpoint of the National Electric Light Association, and, as chairman of the Electrical Manufacturers' Council, in carrying to successful consummation the movement he initiated to effect the organization of a single industry association to embrace the membership of the Electrical Manufacturers' Council, the Electric Power Club and the Associated Manufacturers of Electrical Supplies that resulted in the formation of the National Electrical Manufacturers' Association.

At the second annual presentation of the McGraw award to electrical jobbers, which was a feature of the convention of the Electrical Supply Jobbers Association held recently at Atlantic City, certificates of honorable mention were extended to four prominent jobber executives in recognition of distinguished service to the electrical jobbing industry. The medal and purse were withheld this year, however, because in the opinion of the judges no definite outstanding contribution to the advancement of the jobbing industry worthy of the McGraw medal was recorded during the year 1925.

The four certificates of honorable mention were extended to Thomas J. Creaghead, president, Creaghead Engineering Company, Cincinnati, for his work in connection with the National Electrical Code, of which he has become the recognized authority and interpreter to the jobbing industry; to Harry F. Thomas, president, Northwestern Electric Equipment Company, St. Paul, who has become an authority on the broad principles of cost accounting for the supply jobber as the result of continued study of the statistics of distribution in the electrical industry; to Warren I. Bickford, secretary and treasurer, Iron City Electric Company, Pittsburgh, for his work in the reorganization and executive direction of the E.S.J.A. catalog committee's project to provide for the benefit of jobbers and their customers improved methods and enlarged facilities for cataloging electrical supplies; to William S. Berry, manager Graybar Electric Company, San Francisco, "for twenty years or more a consistent and tireless worker for the encouragement of high ideals of service among the electrical jobbing fraternity of the Pacific Coast, in recognition of his splendid record of constructive contribution to the jobbing branch of the electrical industry."

The James H. McGraw award was established by Mr. McGraw "to encourage constructive thinking for the advancement of the electrical industry."

Firm Erects Building to Care for Increased Business

A steady increase in the business of A. H. Cox & Company, Inc., electrical jobbers of Seattle, resulted in the need for larger quarters, and the demand has been met by the erection of a building at 1757 First Avenue South designed to meet the growing requirements of the business. The new premises have been occupied by the firm since May 1, 1926.

The new building has 10,000 ft. of well lighted main-floor display space served by overhead crane and with rail facilities in the rear of the building. A mezzanine floor of 1,500-ft. area is used for office purposes. The new quarters are used for display purposes only, the shop and all surplus stock being housed in a building on Utah Street.

The business was started in 1912 by A. H. Cox and was operated by him until 1916 when the firm was incorporated with a capital stock of $20,000 with A. H. Cox as president, R. W. Thompson, vice-president, and W. E. Cox secretary and treasurer. The company moved into business quarters at 309 First Avenue South, later moving to 307 First Avenue South. In March, 1918, the interest of R. W. Thompson in the business was purchased by A. H. Cox and W. E. Cox. In 1919 W. E. Cox retired from active participation in the business and H. W. Higman was elected secretary and treasurer of the corporation.

Recent Applications Filed for California Water Rights

The following applications recently were filed with the California Division of Water Rights:

By the American River Water & Power Company, c/o Fred Dewhirst, 4444 Moraga Avenue, Oakland, Calif., for 200 sec.-ft. and 50,000 acre-ft. per annum from the North Fork of the American River tributary to the American River to be used for a proposed power project estimated to cost $1,000,000; by the Red River Lumber Company, c/o J. H. Hunter, Westwood, Calif., for 150 sec-ft. from Mill Creek tributary to the Sacramento River to be used for power purposes; by the American River Hydro Electric Company, c/o S. E. Kieffer, 57 Post Street, San Francisco, for 2,000 sec.-ft. and 320,000 acre-ft. per annum from the American River tributary to the Sacramento River, to be used for a proposed power project in the development of 45,227 theoretical horsepower at an estimated cost of $7,000,000.

The division has issued to The Nevada California Power Company, Riverside, Calif., permit for the diversion of 30 sec.-ft. from Leevining Creek for power purposes. The cost of the project will be approximately $1,170,022.

Utility Announces Winners of Women's Essay Contest

One of the activities of the Women's Co-operative Association of the central district, Puget Sound Power & Light Company, Seattle, was an essay contest designed to rouse the interest of its women employees in the problems of the electrical industry and of the Puget Sound company in particular. Substantial prizes were offered by R. M. Boykin, manager central district, for the three best essays.

The winners recently were announed as follows: first, Dorothy Middleton, sales department, "Exit the Ox-Woman;" second, Elizabeth Ziegler, "Organization;" and third, Ruby Hollenbeck, secretary to the manager, "Load Building and Public Relations, and the Women's Co-operative Association."

Grass and shrubbery make particularly attractive the building erected by A. H. Cox & Company, Inc., electrical jobbers, of Seattle, for stock display purposes.

Proposed Franchise Submitted to Denver by Public Service Company

The Public Service Company of Colorado, Denver, has submitted to the city a proposed franchise, rate ordinance, standards for gas and electric service, and a contract for street lighting. The company's previous franchise expired May 15 of this year.

The new franchise provides that the company shall co-operate with the city in investigating the economic possibilities of hydorelectric power incident to the water-supply development for the city, and states that, in the event the city develops a plan including the production of hydro power, the company agrees to purchase such power in an amount and kind to the extent that its market can absorb. The price to be paid shall be equal to the cost to the company of supplying power of the same kind by other means.

Proposed rates for domestic electric and gas service are incorporated in the new franchise proper. Rates for other classes of service are submitted in a separate document, to be filed with the city clerk in advance of the franchise election. It is provided that rates for service other than domestic may be changed during the life of the franchise "by concurrence of the company and the city council." Both the proposed domestic gas and electric rates are based on the Wright demand rates which are considerably lower than the rates now in effect in Denver. The company estimates that the new rates submitted to the city, if adopted by the people, will effect a saving to the consumers of approximately $350,000 a year.

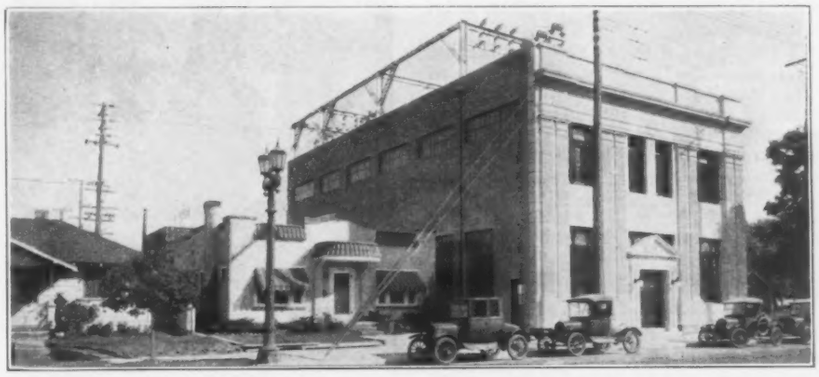
The new commercial lighting rate is graduated according to consumption, ranging from 7.5 cents per kw-hr. to 1.35 cents per kw-hr. The present rate for this service ranges from 8 cents to 0.35 cents per kw-hr.

Under the old franchise the company paid annually to the city a $50,000 franchsie tax. This provision has not been made in the new proposal, but rather the company calls attention to this omission in the following words: "Provision for a franchise tax has purposely been omitted for the reason that we believe it better to give to the consumers the benefit of the amount which has heretofore been paid to the city. This matter we will be gald to discuss at the forthcoming public meetings."

Though the company submitted its proposed franchise to the city on Oct. 18 and it was believed that public hearings would be held shortly afterwards, considerable opposition arose regarding the desirability of such procedure because of the fact that the engineers hired by the city to determine the value of the company's holdings had not completed their report. This investigation, covering a period of nine months and costing the taxpayers of Denver $60,000, was completed Nov. 3, and the report made public. Comments on the company's service and other matters of general interest were likewise included. The city's engineers placed a valuation of $30,995,767 on the company's property that is used for the supplying of electricity and gas to Denver consumers. Company officials, in commenting on the report of the city's engineers, declared that they did not agree with the valuation totals, believing that the engineers have left out of their calculations a number of plants necessary for an uninterrupted supply of service to the city of Denver. The company also has stated that the city's experts have allowed a lesser valuation on certain properties than have been fixed by the federal courts. The company's valuation total, submitted to the city early this year, was $39,515,446.

One important difference in pricing between the two groups of engineers pertains to the Shoshone water rights, which cost the Public Service Company $670,000, which were appraised by the federal court at $500,000 in the Colorado Power Company rate case, and which were valued at only $232,745 by the city's engineers.

On the suggestion of Ray Palmer, engineer in charge employed by the city, conferences will be held between the engineers representing the city and the company, and interested city officials and representatives of civic organizations, after which the chairman of the utilities commission of the council will call further public meetings.



This new substation at 5518 South Western Avenue, Los Angeles, recently was put into service by the Los Angeles Gas and Electric Corporation. Built for an ultimate capacity of three 5,000-kva. transformer banks and fifteen 1,000-kva. circuits, the station at present is equipped with one bank of three 1,500-kva. transformers supplying three circuits at 4,000 volts, and one bank of three 500-kva. transformers supplying two circuits at 2,300 volts. All equipment is remote-controlled electrically from the switchboard on the second floor. All transformers, regulators and low-tension buses are on the ground floor, while the 33-kv. oil switches and 33-kv. buses and battery room are on the second floor. The architectural simplicity and generally pleasing appearance of both the station and the operator's bungalow adjoining make this an attractive example of substation design.

Lighting Committee to Conduct School in San Diego

During the week of Jan. 9, 1927, the lighting committee of the Pacific Coast Electrical Association, under the leadership of Clark Baker, Sr., is planning to conduct a lighting school in San Diego, Calif. Classes will be held in the basement of the Electric Building. There will be five classes, as follows: Monday evening at 7:30; Tuesday afternoon at 2 o'clock; Wednesday evening at 7:30; Thursday at 2 o'clock in the afternoon and 7:30 in the evening.

Tuition will be $10 for the course and this sum will be refunded if the individual attends all of the lessons, $2 being subtracted for each lesson that is missed. The class will be limited to forty persons.

Court Renders Decision in Suit Involving Heater Patent

Patent rights under patent No. 1,518,067, dated Dec. 2, 1924, issued to W. Wesley Hicks, manufacturer of Wesix electric heaters, have been upheld in a decision by Judge Frank H. Kerrigan of the United States District Court in an infringement suit against the Majestic Electric Appliance Company, Inc. In sustaining the claims the court enjoined the Majestic company from manufacturing certain types of heaters and ordered an accounting of profits said to have resulted from the infringement. In his opinion Judge Kerrigan said:

> The evidence shows that a heater made in accordance with the plaintiff's patent is capable of distributing heat by both radiation and convection, and is particularly useful in heating large areas. It appears to have met a long existing public need, and to be the first electric appliance of its kind to accomplish satisfactorily the heating of a large enclosure, and the evidence tends to show among other things that the plaintiff's heater was the first of its kind to be both practical and saleable.

Judge Kerrigan also made a general comment on the subject of patents in his decision when he said:

> A patent granted by the government of the United States is intended to reward the person who by his talent and industry has produced a meritorious and useful invention, and thereby contributed something beneficial to the public; and courts, in deciding cases in which infringement arises, recognize and follow this policy.

In a letter issued to the trade the Majestic Electric Appliance Company, Inc., states that the decision does not refer to heaters manufactured by the company at the present time and cites a letter to the trade sent out July 22, 1926, in which all previous types manufactured were declared obsolete. In its letter the Majestic company also announces that steps are under way to appeal the case to the United States Circuit Court of Appeals.

Utah Company Takes Over Moab Plant.—The Utah Power & Light Company has taken over the property of the Moab Power & Light Company at Moab, Utah. Service to the former consumers of the Moab company began on Sept. 1 under the new management. Approximately 175 customers are served by the Moab plant.

News Briefs

Nevada Utility Applies for Transmission Line License.—The Nevada Valleys Power Company, of Lovelock, Nev., has applied to the Federal Power Commission for a license covering a transmission line from its Lahontan power house. The line will be 29 miles long and will connect with the line of the Truckee River General Electric Company.

Utah Towns Plan Street Lighting Systems.—The town of Malad, Idaho, will install a new system of street lighting in the near future, which contemplates providing about three times the street lighting now in effect. The town of Murray, Utah, now is contemplating a program which includes a new "whiteway" lighting system, and will necessitate the installation of about fifty-four standards. If this program is decided upon the work will be done early next year.

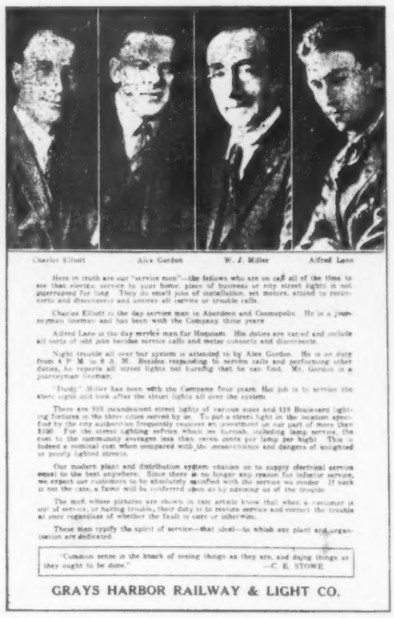
San Joaquin Corporation Authorized to Issue Stock.—San Joaquin Light & Power Corporation, Fresno, Calif., has been authorized by the California Railroad Commission, in a supplemental order, to issue and sell $364,000 of 7 per cent prior preferred stock and $1,636,000 of 6 per cent prior preferred stock in lieu of the $500,000 of 7 per cent preferred stock and $1,500,000 of 6 per cent preferred stock previously authorized by the commission.

Dixie Power Company of Utah Plans Supplementary Generating Plant.—The Dixie Power Company of St. George, Utah, is contemplating filing an application with the Public Utilities Commission of Utah for permission to build a supplementary hydroelectric generating plant on the Santa Clara River in Washington County, Utah. The proposal is to build an 800-kw. plant below its present No. 2 station at an expenditure of about $200,000.

Colorado Utility Opens New Offices.—The new building of the Southern Colorado Power Company, Pueblo, containing the general offices and appliance sales department, recently was opened formally. J. W. Devereaux, manager of merchandising and electrical appliance sales for the Byllesby Engineering & Management Corporation, directed activities in connection with the event. The electrical appliance display occupies a space 50 x 30 ft. in the front part of the office, and the main floor of the offices occupies 6,120 sq.ft.

Court Rules Company Liable for Compensation in Case of Electrocution of Employee Leaving Place of Enjoyment by Unforbidden Short Cut.—The Supreme Court of Utah recently ruled in the case of the Utah Apex Mining Company vs. Industrial Commission of Utah that the death of an employee of the company caused by contact with an electric cable while the worker was leaving the company's property by a short cut which employees had not been forbidden to use but which was used without their employer's knowledge, occurred "in course of employment" and that compensation was due.

California Railroad Commission Authorizes Utility to Issue Stock and Bonds.—The Railroad Commission has authorized Peoples California Hydro-Electric Corporation to issue not exceeding $35,000 of stock and not exceeding $65,000 of bonds for the purpose of acquiring the properties of Fort Bragg Electric Company. The purchaser made application to the commission for permission to issue $75,000 of stock and $150,000 of bonds for the purpose of acquiring the properties in question, but the commission authorized the issuance of $100,000 of securities only, and required applicant to file stipulation that it will not issue or record on its books any form of indebtedness to represent the difference between the amount of $100,000 authorized and the $225,000 applied for. The commission also has initiated a proceeding on its own motion for the investigation of the rates, rules and regulations of Fort Bragg Electric Company.


Charles Elliott
Alex Gordon
W. J. Miller
Alfred Lane
"Common sense is the knack of seeing things as they are, and doing things as they ought to be done." —C. E. STOWE
GRAYS HARBOR RAILWAY & LIGHT CO.

One of the "Get Acquainted Series" of advertisements published in local newspapers by the Grays Harbor Railway & Light Company, Aberdeen, Wash. In friendly, chatty style these advertisements introduce different employees of the company and explain the work they do, thus making an opportunity to emphasize, in the wording of this advertisement, the spirit of service—that ideal to which the plant and organization are dedicated.

B. C. Mining Company Installs Two Steam-Driven Turbo-Generators.—The Consolidated Mining & Smelting Company of Canada is installing two steam-driven turbo-generators, each of 1,500-kw. capacity, at its Sullivan mine at Kimberley, B. C. The generators are for use during water shortage when the East Kootenay Power Company is unable to supply all the current required by the smelting company. The Consolidated company is about to put into operation the new 1,000-ton unit to its concentrator, which will bring its daily capacity up to 4,000 tons. It is this new addition that has necessitated the installation of the generators.

Electric Meter Shop Team Wins First Aid Contest.—During Safety Week, observed recently in San Francisco, a special resuscitation test was held in the Civic Auditorium. The contest was won by the Electric Meter Shop team from the Pacific Gas and Electric Company with a perfect score, 100 per cent, and was presented with the Dr. James Eaves trophy, a bronze cup. The team was composed of Carl J. Macintire, captain, Donald Westdyke, Raymond Miller, Elliott Sidey, Frank Griffin, Donald Cameron and Stephen Grosscup.

Utah Municipalities Protest Rates.—A resolution authorized by the representatives of 26 cities in Utah at a recent meeting of the Municipal League, asks the public utilities commission of the state to investigate the rates charged by the Utah Power & Light Company. The resolution cites rates in Los Angeles, Pasadena, Seattle and Tacoma, municipal ownership strongholds, and demands that the Utah company be made to show cause for its present rates. Mayor C. C. Neslen of Salt Lake appointed the committee to draw up the resolution.

A.I.E.E. News

Institute meetings as now scheduled, according to the national secretary, are as follows: Feb. 7-10, 1927, New York, winter convention. March 17-18, 1927, Kansas City, regional meeting. April 14-16, 1927, Bethlehem, Pa., regional meeting. May 25-27, 1927, Pittsfield, regional meeting. June 20-24, 1927, Detroit, summer convention.

Los Angeles Section is to be the guest of the student branches of the University of Southern California and the California Institute of Technology at a joint meeting Dec. 7. The meeting is to be held on the "Cal. Tech." campus in Pasadena where those attending will be served a dinner and subsequently entertained with numerous laboratory demonstrations.

San Francisco Section will meet Nov. 19 to avoid competing with Thanksgiving festivities. R. B. Kellogg, Pacific Gas and Electric Company, will discuss Automatic Substations. The meeting will be held in the Engineers Club rooms at 57 Post Street and will be preceded by dinner at Marquard's Cafe, Geary and Mason Streets.

Seattle Section is to be addressed on Dec. 15 by J. D. Ross, superintendent of the Seattle municipal light and power department, on the subject. The Diablo Development of the Skagit River Project.

Vancouver Section will hold its regular meeting Tuesday, Dec. 7. Douglas Robertson will speak on the subject of Electric Boilers.

Vancouver Section official personnel for 1926-27.—Chairman, R. L. Hall, secretary, C. W. Colvin; executive committee—R. L. Hall, A. Vilstrup, C. N. Beebe, A. C. R. Yuill, C. W. Colvin; meetings and papers committee—A. Vilstrup, F. W. MacNeil, J. Teasdale; membership committee—C. N. Beebe, D. M. Johnstone, W. C. Mainwaring, E G. Craigen, A. M. Clark, A. H. Hopkins.

Northwest Electric Light & Power Association

Commercial Section Committee Chairmen Appointed

Announcement of appointments of committee chairmen in the Commercial Section of the Northwest Electric Light and Power Association has been made by the section chairman, George C. Sawyer, sales manager, Pacific Power & Light Company, Portland. These appointments are:

Home lighting—A. C. McMicken, sales manager, Portland Electric Power Company, Portland; industrial lighting—A. C. McMicken; street and highway lighting—F. H. Murphy, illuminating engineer, Portland Electric Power Company, Portland; commercial cooking—J. C. Plankington, sales manager, Northwestern Electric Company, Portland; competitive power—B. P. Baily, district manager, Pacific Power & Light Company, Yakima, Wash.; refrigeration—Lewis A. Lewis, sales manager, The Washington Water Power Company, Spokane; general merchandising—R. M. Bleak, manager merchandise and lighting sales, Utah Power & Light Company, Salt Lake City; domestic electric range—J. F. Orr, sales manager, Idaho Power Company, Boise; industrial heating—R. W. Clark, sales manager central district, Puget Sound Power & Light Company, Seattle; transportation—L. R. Grant, assistant sales manager central district, Puget Sound Power & Light Company, Seattle; and customer relations—E. L. Crockett, assistant to vice-president, Eastern Oregon Light & Power Company, Baker, Ore.

Some changes in committee designations are noted from those of last year. These have been made to conform to the new classification of Commercial Section committees by the N.E.L.A.

Definite work of the section for the year has not been outlined as yet in the Northwest. The chairman proposes to defer his executive committee meeting until after the Commercial National Section meeting in Chicago in November, at which the Northwest will be represented, so that the work in this geographic division may be co-ordinated with the national program.

Women's Committee Holds First Meeting of the Year

One hundred per cent attendance and a proportionate enthusiasm marked the first meeting of the year of the Women's Committee of the Northwest Electric Light and Power Association, called to order by Marguerite Butler, Portland Electric Power Company, Portland, chairman, at the Benson Hotel, Portland, Oct. 18. Fourteen chairmen of local women's committees were present, representing every organized women's committee in the territory.

It was decided to study certain subjects in committees during the year, and committees were appointed for this purpose with the following chairmen: personnel problems—Mary K. Walsh, The Washington Water Power Company, Spokane; programs for smaller companies—Stella Dorgan, Mountain States Power Company, Albany, Ore.; co-operation with women's clubs—Ellen McCurdy, Pacific Power & Light Company, Walla Walla, Wash. These committees were instructed to report at the second and last meeting of the general committee, which is to be held some time in the spring of next year.

Miss Butler, who had attended the meeting of the National Women's Committee in Chicago, Oct. 4-5, reported on the program adopted by that committee. This program is based on the idea that utility women should understand the operation of electrical appliances, and lists a number of subjects suitable for the program of company meetings. Lectures covering these subjects are to be sent out. A number of films produced by the General Electric Company also are to be made available for such meetings.

Reports covering work done in the companies since last meeting were given by a number of the chairmen. Edna Comstock, delegate from the Oregon Public Utility Information Bureau, Portland, distributed a quantity of literature prepared by that bureau to combat the Oregon water and power development measure of the Housewives' Council, to be voted on at the November election, and made available to the committee all the data in her office to assist members in preparing essays on a variety of utility subjects. A short talk on public relations was given by W. P. Strandborg, publicity agent, Portland Electric Power Company, Portland.

P.C.E.A. News

"Behind the Scenes" Program for Advertising Section

"Behind the Scenes" will be the keynote of the meeting to be held by the Advertising-Publicity Section at the Hotel Biltmore in Los Angeles Dec. 3. Details of the program follow:

10 a.m. to 12—Business session. Section Chairman R. E. Smith, presiding.

12 m: Luncheon at the Biltmore.

2 to 5: "Behind the Scenes" program, D. L. Scott, chairman.

Discussion: "Behind the Scenes in a Public Utility Advertising Department."

J. Charles Jordan, advertising and publicity director, Pacific Gas and Electric Company (30 minutes). Mr. Jordan will illustrate his address with slides.

Richard E. Smith, advertising manager, Southern California Edison Company (10 minutes).

J. F. Pollard, vice-president and general manager, Coast Valleys Gas & Electric Company (15 minutes).

General discussion (25 minutes).

Discussion: "Behind the Scenes with an Engraver."

Ralph L. Garnier, proprietor, Garnier Engraving Company (30 minutes).

General discussion (25 minutes).

Discussion: "Behind the Scenes with the Typographer."

Henry Mayers, president, the Mayers Company (20 minutes).

General discussion (25 minutes).

Hydro Developments Discussed at Chicago Meeting

By J. M. GAYLORD, chairman P.C.E.A. Hydraulic Power Committee

Fishways, water-wheel testing, forecasting water supply, guide bearings, packing for hydraulic machines, governor problems and draft tubes were the subjects of progress reports by respective subcommittees at the meetings of the hydraulic power committee, N.E.L.A., at Chicago Oct. 13-14. Completed reports were presented covering mechanical reliability of hydroelectric units for the year 1925 and covering hydro plant layout. Dr. N. W. Cummings gave a final report of his evaporation research work at California Institute of Technology.

Discussion confirmed the logic of assigning to the geographic divisions the study of subjects that can be handled by the division better than by the national committee. For example, problems relative to high-head development are of general interest, but can be studied to best advantage by the Pacific Coast. Penstock valve study has been adopted as a national study.

N.E.L.A. Recognizes P.C.E.A. Customer Relations Work

Recognition has been accorded the work of the 1924-25 customer relations committee of the P.C.E.A. Commercial Section by the Commercial National Section in that the Pacific Coast association's committee report has been copied in full in Service Suggestions, the publication of the N.E.L.A. section's customer relations committee.

The first part of this report, "Better Customer Relations Through Our Employees," which was published in the June 1, 1925, issue of the Journal of Electricity on pp. 390-393, appeared in the July-August number of Service Suggestions. The second part, "The Proper Treatment of Our Customers," pp. 393-397 of the above issue of the Journal, comprises the entire contents of the September-October number of the N.E.L.A. publication.

Chicago Meeting Co-ordinates Meter Committee

By A. J. HALL, chairman, P.C.E.A. Meter Committee

Thorough co-operation with geographic divisions, success and extension of educational courses for metermen, and a study of meter test periods were the outstanding features of the national meter committee meeting held in Chicago Oct. 13-14. Full co-operation is resulting in mutual advantage to the divisions and to the national committee. Meter test periods were a subject of great interest. Many states now have official regulations governing the test periods and others are considering such action. Educational courses for metermen now are available each year in all but eight states, and the interest in them is on the increase.

Attention also was given to the increasing responsibilities of the test departments of electric service companies. Watthour meters now are but one item of the work. Standardization is progressing.

News of the Electragists

Will Hear Reports on Article Five and Wiring Conference

To hear a report on the work of the Article Five committee on the revision of the National Electrical Code from Ben C. Hill, supervising inspector of the city of Oakland, and president of the California Association of Electrical Inspectors, who was a delegate to the recent meeting held in Atlantic City, the Electragists of the San Francisco Bay region have called a meeting to be held at the Palace Hotel, Friday, Nov. 19. At the same time C. T. Hutchinson, president, McGraw-Hill Company of California, who attended the meeting of the Electrical Industry Conference on Wiring, held in New York City, Oct. 15, will relate what took place in that important conference.

An invitation to attend the dinner meeting has been sent out by C. L. Chamblin, president of the California Electragists, to those interested in these reports.

The Article Five committee met in Atlantic City (see Journal of Eletcricity, Nov. 1, 1926, p. 354) to consider revision of article five of the National Electrical Code, and to establish a more detailed and specific code on wiring methods. Mr. Hill was the California representative to the meeting, representing the California Association of Electrical Inspectors, the California Electragists, and the California Electrical Bureau. Mr. Hill is to relate the efforts made by the committee to secure a more adequate article five for the revised code, discussing various factors leading to the decisions reached.

The Electrical Industry Conference on Wiring was called to consider the economic factors underlying the present controversy between the National Electric Light Association and the Association of Electragists, International, on the subject of the Electragists' all-metal wiring standard and its effects on the expansion of house-wiring business.

Statements were presented by the chairman of the delegation representing the National Electric Light Association, the National Electrical Manufacturers' Association, the Electrical Supply Jobbers' Association, and the Association of Electragists, International. The Electragists were said to have presented a strong case, calling for further discussion of the points brought out in the conference. An executive committee was appointed comprising the four delegation chairmen and Earl E. Whitehorne, commercial editor of Electrical World, chairman of the conference, to collect and compile information and facts bearing on the issues involved, namely, whether the all-metal wiring standard is more expensive than non-metalic wiring methods, and whether the all-metal standard, be it more or less expensive, restricts the market for wiring. A further meeting of this conference is to be called after this committee has made its report.

Mr. Hutchinson, in New York at the time, attended the conference on behalf of the Journal of Electricity. He will tell the Electragists meeting, Nov. 19, further details of the industry wiring conference.

W. A. Castleton, formerly **Thompson & Castleton,** electrical dealers at 1414 Alaska Building, Seattle, has recently awarded contract for a $30,000 business block on First Avenue near Lander Street. The building will be leased to the **Cunningham Electric Company,** now located at 912 First Avenue South. The structure will be 60 x 150 ft., one-story, of concrete.

R. H. Manahan (left) chief, Department of Electricity, Los Angeles, and Frank A. Short, Safety Electric Products Corporation, Los Angeles.

Aberdeen Contracting Firm Under Reorganization Renamed

Formerly known as the Phillips & Thomas Electric Company, S. P. Phillips and F. P. Thomas recently announced that the company had been reorganized under the name of the Electric Equipment & Engineering Company, located as formerly at 206 East Wishkah Street, Aberdeen, Wash.

In the reorganization P. A. Bertrand was named president, S. P. Phillips vice-president, and F. P. Thomas secretary. D. C. Bertrand, formerly with the Great Western Power Company of San Francisco, resigned from that company recently to become affiliated with the new company in Aberdeen.

The new company engages in wiring, specifications for industrial installations and merchandising of high-grade fixtures and appliances, and electric ranges and refrigerators actively are merchandised.

Denver Contractors Learn of Red Seal Plan Operation

Thirty-eight contractors and journeymen of Denver and suburban area attended an evening meeting arranged by the Electrical League of Colorado, Oct. 21. The purpose of the meeting was to explain the Red Seal Plan in detail and to encourage electrical contractors to tie in with the League"s advertising and promotional activity. League and non-league members alike were in attendance.

In order that the contractors might be better able to plan Red Seal layouts, a blackboard demonstration was given by the League's executive manager, George Bakewell, Jr. This illustrated the method of increasing the electrical installation in a two-story residence so as to conform to the minimum standards adopted for the community.

According to E. A. Scott, chairman of the League's Red Seal Committee, the meeting was a decided success, and a great interest on the contractors' part is evidenced. Similar educational meetings are to be arranged in the near future.

H. C. Reid & Company, Electragists of San Francisco, recently announced they had been given exclusive rights to install Central fire-protection devices in northern California. **J. B. Cone** has been announced as in charge of the work.

J. A. McWilliams, Red Seal representative for the California Electrical Bureau, was the feature speaker at the Oct. 14 meeting of the **Marin County Electrical Development League,** according to announcement made by **H. V. Patton,** secretary of the league.

Keith's Electric, Ellensburg, Wash., wiring contractors and dealers in electrical appliances and fixtures, has been purchased by the **Puget Sound Power & Light Company,** according to **V. P. McNamara,** resident manager. Mr. Keith will remain with the company as sales manager.

The Electrical Contractors Association of Seattle recently entertained **J. A. Fowler,** president of the Electragists International, at a banquet at the Olympic Hotel, presided over by **S. G. Hepler,** president of the Seattle association. During his day's stay in Seattle, Mr. Fowler was entertained with a trip to Snoqualmie Falls.

The city of Walla Walla, Wash., will shortly have in operation a new electrical code, worked out by City Electrician **John Casey,** with the advice of the electrical bureau of the Board of Fire Underwriters. Under the ordinance all electrical supplies sold in the city must have the approval of the city electrician and meet with the requirements of the city code.

C. A. Utley, formerly of the Pelton Water Wheel Company, has taken over the capital stock of **James Woods** and **F.E. Kayo** and now is president and general manager of the **California Mechanical and Electrical Engineering Company,** located at 1110 J Street, Sacramento. **R. J. Finchley,** formerly president and manager, will become superintendent of outside construction under the new set-up.

Meetings

Joint Pole Committee Celebrates Twentieth Anniversary

At a luncheon recently held in honor of the twentieth anniversary of the existence of the Joint Pole Committee of Los Angeles, J. E. Macdonald, who has been secretary for the entire life of the committee, was presented by his fellow members with a Hamilton gold watch. E. R. Morehouse, superintendent of the Los Angeles Gas & Electric Corporation and a member of the original committee, made the presentation speech.

Speeches were made by R. E. Cunningham, formerly of the Southern California Edison Company, and Claude Campbell of the Los Angeles Railway Company, both of whom were members of the original committee. About forty were present at the luncheon.

The Los Angeles Joint Pole Committee represents seventeen different public utilities doing business in southern California, and during the twenty years which it has been operating has effected great economies in pole costs for all its members.

Prominent Official of Graybar Company Luncheon Guest

Thirty-five Graybar Electric Company officials, department heads, and salesmen attended a luncheon in the Tapestry Room of the Palace Hotel in honor of Frank A. Ketcham, executive vice-president, who recently paid a visit to the Pacific Coast.

Mr. Ketcham spoke of the progress which has been made by the Graybar Electric Company, formerly the supply department of the Western Electric Company. He dwelt particularly on the important part the company has played in the development of such outstanding achievements as the Vitaphone, which synchronizes speech with motion pictures, and the electrical recording of phonograph records.

He also spoke enthusiastically of the new Graybar Building, the largest office building in New York, which now is being constructed to house the executive offices of the company.

Electragist President Talks to Rocky Mountain League

At a meeting held recently in Salt Lake City by the Rocky Mountain Electrical Co-operative League Joseph A. Fowler, president of the Association of Electragists, International, was the guest of honor and principal speaker.

In his talk Mr. Fowler stressed the importance of the electrical contractor-dealer as a factor in the welfare of the electrical industry, and urged the members of this branch of the industry to play their full part in helping to promote its best interests.

Ed. H. Eardley, of the Eardley Electric Company, former district representative of the Association of Electragists, International, presided at the meeting, which was attended by a large number of people in the electrical industry.

Heating Devices Section of the N.E.M.A. Elects Officers

At the annual meeting of the Heating Devices Section of the National Electrical Manufacturers' Association held at the Mansfield Works of the Westinghouse Electric & Manufacturing Company, H. J. Mauger, of the Edison Electric Appliance Company, Chicago, was elected chairman; A. T. Fish of the Lindemann & Hoverson Company, Milwaukee, secretary; and J. S. Kennedy, of Landers, Frary & Clark Company, New Britain, Conn., treasurer.

The thirteen members of the Heating Devices Section in attendance at the meeting were entertained by the Westinghouse company with a luncheon and dinner at the Westbrook Country Club, and were conducted on a tour of inspection through the local Westinghouse factory, where household heating devices are manufactured.

COMING EVENTS

Pacific Coast Electrical Association—
Meeting of Executive Committee
Office of Secretary, 447 Sutter Street, San Francisco
Nov. 19, 1926, at 2 p.m.

Purchasing and Stores Section Meeting
San Francisco, Dec. 2-3, 1926

Advertising-Publicity Section—Quarterly Meeting
Edison Building, Los Angeles
Dec. 3, 1926

Northwest Association of Electrical Inspectors—
Annual Convention—Multnomah Hotel, Portland, Ore.,
Jan. 17-18, 1927

Pacific Division, Electrical Supply Jobbers' Association—
Quarterly Meeting—Hotel Del Monte, Del Monte, Calif.
Jan. 27-29, 1927

Chico League Discusses Electric Cooking.—H. A. Cram, factory representative of the Universal Electric Appliance Company, was the speaker at the monthly meeting of the Northern Counties Electrical Development League, held in Chico, Calif., recently. Electric cooking was the subject of discussion at the meeting, several other speakers from local circles taking part.

Division Manager Host at Staff Dinner.—The sales staff of the Sacramento division of the Great Western Power Company of California a short time ago was tendered a dinner at the Del Paso Country Club by H. E. Brillhart, division manager. The program was in charge of Monte Pfyl, Miss Martha Robinson took care of the menu, and credit for the decorations was due Mrs. Boatwright. F. H. Woodward, general sales manager of the company, with headquarters in San Francisco, and Mrs. Woodward were special guests at the dinner.

Colorado Electrical League Holds Annual Roundup of Members.—Electrical men and their families, more than 300 in number, were in attendance at the annual fall "Roundup" of League members arranged by the Electrical League of Colorado, Denver. In order to create an atmosphere of the days of '49, those present were permitted to "gamble" with scrip for hams, candy and other articles provided for the occasion.

Book Reviews

PRINCIPLES UNDERLYING THE DESIGN OF ELECTRICAL MACHINERY

By W. I. Slichter, Professor of Electrical Engineering, Columbia University; Consulting Engineer, New York City. 312 pages. 152 illustrations. 55 tables. 6x9 in. Cloth-bound. 1926. Published by John Wiley & Sons, Inc., New York City. Price $3.75.

The author is a designing engineer of broad experience. The text of this book has been developed from a course of lectures given by the author at Columbia University and is based upon experiences of the author in his practicing career.

The subject matter is handled in a logical sequence beginning with a brief discussion of general principles and fundamental relations. The treatment then progresses consecutively through studies of the d.c. generator, the salient-pole a.c. generator, the turbine-driven a.c. generator, the transformer, and the induction motor. Each of these subjects is dealt with in a separate chapter beginning with a discussion of the fundamental principles involved in the construction and operation of the particular equipment described in that chapter and then progressing on through the detailed design features and problems.

Formulae have been derived from fundamental principles and are accompanied by explanations of each formula and the reasons for the various standards of practice as outlined in the text. The objective of the author according to his own statement is to give a practical method of design, together with explanations of the physical meaning of the arbitrary constants used by the professional designing engineer.

The book is suitable for use as a text in technical schools and also should serve at least the younger generation of graduate engineers as a reference explaining the "why" of certain conventional design practices.

G.R.H.

Byllesby Company Issues Booklet on its Properties.—H. M. Byllesby & Company has just published a comprehensive 32-page illustrated book describing Standard Gas & Electric Company and its operated and affiliated public utilities. Forty-five photographs of the principal steam and hydroelectric stations, gas manufacturing plants, substations, etc., are reproduced. A large four-color map, showing the extent and diversification of the company's investments is included.

High Steam Pressures and Temperatures.—Serial report of the prime movers committee, N.E.L.A., giving data gathered from plants employing a high-pressure or high-temperature steam cycle. Data are tabulated in a form permitting analysis of heat consumption of these plants. Well illustrated. Published July, 1926. Price to members 10 cents.

Personals

William S. Berry, manager, Graybar Electric Company, San Francisco, has received a certificate of honorable mention under the James H. McGraw Award for 1926 "in recognition of his splendid record of constructive contribution to the jobbing branch of the electrical industry." After setting forth that Mr. Berry has been a consistent and tireless worker for the encouragement of high ideals of service

WILLIAM S BERRY

among the electrical jobbing fraternity of the Pacific Coast for twenty years or more, the citation continues: "He has been an outstanding leader in cooperative work. He has served the Pacific Coast Jobbers Association as chairman and in every capacity on committees. He was a large factor in developing the California Electrical Co-operative Campaign and the California Electrical Bureau. He was a member of the advisory committee in the promotion of the convenience outlet, the electrical home, and the Red Seal campaigns. He was one of the early presidents of the San Francisco Electrical Development League in the days when the league was languishing for lack of interest and he contributed largely to bringing about its present position of importance. He has taken a broad constructive interest in the welfare of the electrical contractor and has worked indefatigably to promote contractors' organizations and to awaken them to a full responsibility in their relations with the other branches of the industry. In a word, the name of William S. Berry has become inseparably identified with the growth of the electrical industry in all its phases throughout the entire Pacific Coast." Mr. Berry, who began his electrical career with the Thomson-Houston Company and later spent some time with the Consolidated Traction Company of Pittsburgh, has been associated with the Western Electric Company and its connections since 1904.

J. K. Knighton, zone sales supervisor for the Frigidaire Corporation in the Seattle district, has gone to Dayton, Ohio, to attend a general conference on sales, advertising and service policies for 1927.

James L. Boone, for the past year assistant attorney with the Utah Power & Light Company, Salt Lake City, has resigned to become attorney for the Idaho Power Company at Boise.

Ralph Clapp, who spent the past year in the U. S. Forest Reserve, has returned to the electrical industry, having re-established the firm of Clapp & Lamoree, manufacturers' agents.

H. H. Daly, sales manager, Mejastic Electric Appliance Company, Inc., San Francisco, returned not long ago from a month's business trip through the Middle West and South.

A. McNaught, who formerly traveled in Nevada and the northern part of California for the Electric Appliance Company of San Francisco, has joined the staff of Alexander & Lavenson of that city.

Ray W. Turnbull, Pacific Coast district manager, Edison Electric Appliance Company, recently returned to San Francisco from Honolulu where he discussed business conditions with the Hawaiian Electric Company.

C. L. Huyck, of the Graybar Electric Company, San Francisco, recently paid a short visit to Los Angeles.

Nathan A. Bowers, Pacific Coast editor of Engineering News-Record, has been elected president of the San Francisco Engineering Club, and **E. M. Breed,** of the Pelton Water Wheel Company, vice-president.

B. A. Seymour, chief clerk of the Monrovia district office of the Southern California Edison Company, has been transferred to the Montebello district as chief clerk. **B. L. Nunnally,** chief bookkeeper in the Whittier district, has been promoted to take the chief clerk's position in Monrovia.

F. E. Davis, for many years connected with Fobes Supply Company, Portland, has been named manager of the Oregon branch of that company to succeed **C. M. Will,** who died June 13, 1926.

R. G. Gentry, manager public relations department, Public Service Company of Colorado, was the principal speaker at a recent meeting of the Gyro Club in Denver. Mr. Gentry's address included many statistics regarding the operations of his company throughout the state.

A. E. Hitchner, district manager for the Westinghouse Electric & Manufacturing Company in Los Angeles, has returned from a month's trip to the East. He attended the district managers' meeting at St. Louis and later spent some time at the Pittsburgh plant.

J. J. Hannemann, manufacturers' representative, National Lamp Works of the General Electric Company, has been transferred from Kansas City to the Mountain states territory with headquarters in Denver.

A. E. Bacon, manufacturers' representative in Denver, recently made a trip to New York and secured the account of Edwards & Company, Inc., for the Mountain states territory.

C. B. Angenette, president, the Domestic Appliance Company, Oakland, Calif., lately has been visiting dealers in Meadows washers in southern California.

D. C. Green, vice-president and general manager, Utah Power & Light Company, Salt Lake City, accompanied by **W. R. Putnam,** vice-president and general manager, Idaho Power Company, Boise, recently made a trip to New York City.

H. H. Higbie, professor of electrical engineering at the University of Michigan, was elected president of the illuminating Engineering Society at its recent convention in Spring Lake, N. J.

R. L. Hearn, chief engineer for H. G. Acres & Company, Niagara Falls, Ontario, Can., not long ago visited The Washington Water Power Company, Spokane, where he was formerly employed as assistant chief engineer. He inspected the new Chelan development in company with **V. H. Greisser,** chief engineer of the company.

F. B. Odlum, formerly of the legal department of the Utah Power & Light Company, Salt Lake City, and now vice-president of the Electric Bond & Share Company, visited that city not long ago.

William Watson, works manager of the Allis-Chalmers Company of Milwaukee, was a recent Seattle visitor. Mr. Watson has been making a survey of the company's holdings on the Pacific Coast.

S. P. Russell, for a number of years part owner and vice-president of the H. B. Squires Company of San Francisco, Los Angeles, Portland and Seattle, has acquired the holdings of H. B. Squires and is now president of the company, which will retain its present name. Mr. Russell, who maintains his headquarters in San Francisco, has been connected with the electrical industry during practically all of his business career. After spending a short time in the drafting room of Charles C. Moore & Company, Engineers, he resigned in 1903 to enter the employ of the Holland Supply Company, which handled steam and electric railway supplies, and a short while later took over the business. He sold it in 1905 to Johns-Manville, Inc., and accepted a position in charge of that company's electrical department for the Pacific Coast. A year later he was transferred to the New York office and in 1907 opened the New Or-

S. P. RUSSELL

leans office of Johns-Manville, Inc. The following year he returned to San Francisco, remaining with that company until 1918 when he joined the H. B. Squires Company. Mr. Russell has devoted much of his time to the study of lighting, and last year served as the chairman of the San Francisco Bay Cities Chapter of the Illuminating Engineering Society. A particularly interesting feature of the change in ownership of the H. B. Squires Company is that a number of the employees who have been connected with the concern for some time have been allowed to acquire some of the stock.

R. H. Ballard, executive vice-president and general manager, Southern California Edison Company, Los Angeles, addressed the Associated Chambers of Commerce of the San Gabriel Valley at a recent meeting.

Granville H. Peets, since August, 1923, assistant to Capt. Norwood W. Brockett, director of public relations, Puget Sound Power & Light Company, Seattle, has resigned to rejoin the Seattle branch of the Knox School of Salesmanship to conduct classes in automobile merchandising among dealers and salesmen throughout the country.

Joseph S. Carroll, of the department of electrical engineering, Stanford University, has been appointed assistant professor in charge of operation and equipment in the Ryan Laboratory under the supervision of **Dr. Harris J. Ryan.**

Lester S. Ready, chief engineer of the California Railroad Commission for the last three and a half years, has resigned from that post, effective Dec. 15, to accept the presidency of the Key System Transit Company. He will enter into active charge of his new duties shortly after the first of the year, with headquarters in Oakland, Calif. Following his graduation from the University of California with the class of 1912, Mr. Ready spent a year in the distribution department of the Pacific Gas and Electric Company and then in 1913 joined the staff of the California Railroad Commission. Until 1919 he held the position of gas and electrical engineer of that body and then he was made assistant chief

LESTER S. READY

engineer. Four years later he was appointed chief engineer. Mr. Ready's long service with the Railroad Commission and his knowledge of conditions in the East Bay district make him particularly well fitted for his new position. In addition to having been a resident of that section for the past fourteen years, he has been closely connected with its development through the Railroad Commission. For that body he has worked upon all the surveys and investigations made of the public utilities operating in the East Bay district, and for that reason he is well ejuipped to handle its transportation problems. **A. G. Mott,** for the last three years transportation engineer of the California Railroad Commission, has been chosen to succeed Mr. Ready. **A. V. Guillou,** who has been gas and electrical engineer of the commission for about the same period, has been named assistant chief engineer.

Lyman D. Morgan, formerly illuminating engineer with the Perfeclite Manufactuning Company, Seattle, has been named northwest manager for the Pittsburgh Reflector Company, Pittsburgh, Pa., with headquarters in Seattle. Mr. Morgan recently spent several months in the East, assisting in the design and installation of the electrical lighting effects on the Tower of Light at the Sesquicentennial Exposition.

Ben Wright, of the Southern California Telephone Company, Los Angeles, returned not long ago from an extensive visit in the East. Mr. Wright is president of the southern California chapter of Bell Telephone Pioneers, and while in New York he attended the national assembly of that organization.

J. H. Siegfried, superintendent of power, Pacific Power & Light Company, Portland, was among those who attended the recent A.I.E.E. convention in Salt Lake City.

J. A. Hale, chief engineer, Utah Power & Light Company, Salt Lake City, recently returned from a short sojourn in New York.

F. L. Maytag, chairman of the board of directors of the Maytag Company, Newton, Iowa, recently was presented with what is claimed as the world's largest and most valuable medallion. The medallion, presented at the second annual dealers' convention banquet in Des Moines, was given to Mr. Maytag "in recognition of his outstanding position as manufacturer and merchandiser of electrical home appliances."

W. F. Raber, general manager, San Diego Consolidated Gas & Electric Company, recently went to Chicago to attend a meeting of the board of directors of the Standard Gas & Electric Company.

John W. Carpenter, formerly connected with the Walker & Pratt Manufacturing Company, has severed his connection with that firm and now is representing the Edison Electric Appliance Company, Los Angeles.

W. A. Scott, who has been associated with the Trumbull Electric Company, has left that company and joined the Safety Electric Products Company, Los Angeles.

Roy Worth has been made office manager of the Electric Corporation, Los Angeles, in charge of office and warehouse, and **Paul H. Anderson** has been appointed manager of its lamp department, succeeding **H. T. Burkey.**

T. B. Harned, Jr., manager, Ohio Electric Cleaner Company, Oakland, Calif., returned a short while ago from the Northwest where he called upon his firm's representatives there. Mr. Harned spent some time both in Seattle and Portland.

R. G. Widdows, sales manager, Electric Controller & Manufacturing Company, Cleveland, recently made a complete tour of the Western territory.

James M. Barry, chief of the department of electricity in San Francisco about 1914-1916 and later connected with the Great Western Power Company in that city, has been made vice-president of the Alabama Power Company, Birmingham. Mr. Barry has been assicoated with the latter company about seven years.

G. H. P. Dellmann, lighting sales engineer, San Diego Consolidated Gas & Electric Company, attended the recent meeting of the lighting committee, P.C.E.A., in Los Angeles.

C. F. Terrell, who has been superintendent of light and power for the El Paso Electric Company, El Paso, Texas, has been appointed general superintendent of light and power for the Tampa Electric Company, Tampa, Fla. Both companies are Stone & Webster properties. Mr. Terrell is well known in the Northwest. Previous to his removal to El Paso he was superintendent of light and power at Bellingham, Wash., for the northern district of the Puget Sound Power & Light Company. Prior to that time he was connected with that company's organization in Seattle in various capacities, including substation operator, load dispatcher, foreman of substations, construction engineer on station

C. F. TERRELL

construction, and superintendent of substation department. After his graduation from the University of Washington in 1910 Mr. Terrell entered the Stone & Webster organization and has been affiliated with it since that time.

Frank H. Woodward, sales manager for the Great Western Power Company, San Francisco, who is vice-president of the San Francisco Lions Club, was among the speakers at the Hallowe'en dinner given by the Santa Rosa Lions Club.

Obituary

V. V. Davoud, for many years an engineer with the Utah Power & Light Company, Salt Lake City, prior to his departure for New York, died in that city recently.

John Jay Sherwin, a pioneer in the electric light and power field in Idaho Springs, Colo., died recently in Denver.

Simon Bamberger, chairman of the board of the Bamberger Electric Railroad, and for four years governor of Utah, died in Salt Lake City Oct. 6, after an illness of less than twenty-four hours, at the age of 81.

Claude Robert Alling, vice-president of Underwriters' Laboratories, died in Evanston, Ill., Oct. 25.

Thomas I. Stacey, secretary and treasure of the Electric Appliance Company, Chicago, died in Evanston, Ill., Oct. 24. Mr. Stacey had been connected with the company since its formation thirty-five years ago and was well known in the West.

TRADE NOTES

Ohio Brass Company has announced the removal of its San Francisco offices to room 532 Matson Building. This arrangement also permits maintenance of better warehouse facilities, the company states.

The Laughlin-Gilmer Company, manufacturers' agent, of Denver, has been named district representative for **I. P. Frink, Inc.,** New York City.

The Electric Corporation, San Francisco, and the **Reiman Wholesale Electric Company,** Los Angeles, have been admitted to membership in the Pacific Division of the National Electrical Supply Jobbers Association, according to recent announcement of Albert Elliot, secretary.

Pass & Seymour, Inc., Solvay, N. Y., is placing on the market a new bracket type receptacle with the standard convenience outlet. The receptacle is supplied in the pull and keyless types with porcelain shade-holder and with porcelain ring. The manufacturer claims an advantage because the porcelain shade-holder and the porcelain ring are made of the same high-grade porcelain as the body of the receptacle and, therefore, can be relied upon always to maintain the same newness and color as the receptacle.

Silent Hoist Winch & Crane Company, Brooklyn, N. Y., has announced the removal of its works and general offices into its new building at 762-772 Henry Street, corner Centre Street. Attention is called to the change in the company's name from "Silent Hoist Company," and the explanation given that the change was made for the sole purpose of more clearly conveying the nature of the company's products.

Federal Steel Products Company, 2-14 Avenue L, Newark, N. J., has ready for distribution its catalog No. 3, which lists most completely all types of externally operated entrance switches, safety switches, steel cabinets, and specialties manufactured by the company. Copies may be secured direct from the home office at Newark or from the Electric Agencies Company, 655 Minna Street, San Francisco, its representatives.

Curtis Lighting, Inc., Chicago, has announced a new design of X-Ray Bank-Ray for bank lighting that consists of small powerful silvered glass X-Ray reflectors concealed in an ornamental housing located at and fastened to the tops of the bank cage cornices and finished in such a way that it appears to be the coping of the grill itself. For direct-indirect lighting, a portion of the light from the X-Ray reflectors is directed down into the cages, but the majority of it is thrown upwards to furnish general illumination for the bank. Where only the bank cage counters are to be illuminated, the top of the Bank-Ray remains housed and all the light is thrown downwards from the lamps in the X-Ray reflectors. For totally indirect lighting, the bottom of the Bank-Ray is closed and all the light is thrown upwards from the X-Ray reflectors in the housing.

Electro-Kold Corporation, Spokane, has had an average increase of 300 per cent a year for the past four years in the volume of its business, according to the report of L. J. Kimmell, vice-president. The output of Electro-Kold electrical refrigeration machines was about 2,000 in 1926, and that number is expected to be doubled next year, he stated.

Chicago Fuse Manufacturing Company, Chicago, has equipped its Gem XC sectional switch boxes with new adjustable clamps, which not only secure the sheathed and metallic cable or loom, but at the same time close up any knockout hole space not filled up by the incoming cable or loom. The new clamp has an extension so that as the screw is turned down this extension covers the openings, if any, depending upon the size of the cable used.

Hats off to the Electragist! Well, with Claude Herbert, manager of the industrial division of the Westinghouse Electric & Manufacturing Company, and Burrell Manuel, sales manager of the Fobes Supply Company, both of San Francisco, standing with bared heads in the presence of Norman Nelson, proprietor of the Enterprise Electric Works, also of that city, it certainly looks that way, doesn't it? The trinity were snapped on the steps of the Del Monte Hotel at the Electragists' convention.

The Swartzbaugh Manufacturing Company, Toledo, Ohio, recently placed on the market its wall-outlet electric range, which it terms "electrically calipoised" to express "perfect balance" between the cooking capacity of the range and the amount of current consumed. The range does all types of cooking and baking, has a toaster and broiler arrangement, is finished in blue-gray enamel and nickel plate, and weighs 65 lb. List price $49.50, equipped with racks and roaster pans.

The Wheeler Reflector Company, 275 Congress Street, Boston, has announced that its "Durex" line of industrial lighting equipment has been increased to include five types of canopy construction and three types of reflector. The five canopies are the stamped standard, the cast standard, the stamped outlet box, the cast outlet box, and the pendant. The reflectors are the R.L.M. standard type, the shallow dome type, and the parabolic type. The printed announcement will be sent on request.

Automatic Electric Washer Company, Newton, Iowa, has announced its new, low-priced Model 20 Automatic washer, which can be retailed for less than $100. This new machine is said to be a machine-made washer, as the entire top, lid, legs, leg braces, and base for copper tub are of pressed steel. The deeply channeled legs are welded electrically to the leg braces in one rigid unit. By the use of these pressed steel parts economies in manufacture are accomplished, it is claimed, and large savings in weight with increased strength are secured. Its design embodies the standard automatic hydro-disc washing principle, and it has 6-sheet capacity self-draining corrugated copper tub, very simple top drive, steel and aluminum reversible swinging wringer with 12-in. full balloon rolls, as well as other advantages, according to the announcement.

The Robinson Sales Company, Polson Building, Seattle, has been appointed by the **Roller-Smith Company,** 233 Broadway, New York, its agent for the state of Washington and most of the state of Oregon. The company also has announced the appointment of the **Ashida Engineering Company, Ltd.,** Daini, Osaka, Japan, its agent for Japan, including Korea and Manchuria.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, has published a rearranged and revised circular, C-1694-B, which gives a more clear conception of supervisory control and its equipment.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has developed a new portable ship type air heater for use in chart houses, pilot houses, etc. It is rated at 500 watts, single heat, 120 volts, and with the exception of the resistance material all parts of the heater are of non-magnetic materials, brass or copper. The maximum dimensions are 10 in. wide, by 11⅞ in. high, 6 in. deep and the weight is slightly less than 15 lb. This form of heater has been designed primarily in accordance with latest Navy Department specifications and it has been given approval by the Bureau of Engineering, Navy Department, Washington, D. C., for installations on board ship where this type of heater is used.

Condit Electrical Manufacturing Corporation, Boston, has issued a new publication, "The Selection and Application of Oil Circuit Breakers." The subject is treated in a comprehensive manner, some of the topics discussed being Methods of Operation, Operating Currents for Electrically Operated Breakers, Recommended Method of Mounting, Selection of Oil Circuit Breakers. The book also contains tables of interrupting capacities for indoor and outdoor service, interrupting capacity and voltage rating data, and numerous diagrams.

Harvey Hubbell, Inc., Bridgeport, Conn., announces a new two-wire "Cord-Grip" locking connector, rated 10 amp., 250 volts. The locking feature of this Hubbell "Cord-Grip" connector provides an extra and very effective safeguard against accidental disconnection, according to announcement. The connectors are built for hard service. The bodies are of strong black composition; the caps are completely armored by a heavy "all-over" shield of steel which is galvanized to prevent corrosion, according to the company.